Alexandre Doumenach MD

*Author of **Vitamin D Vitamin C Iodine***

Iodine

Why more is better

Introduction by Bernard Fontaine MD

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I dedicate this book to my wife and children because the thought of them drives me; Kazimiera and Gemma for supporting me spiritually; and all doctors who have dedicated their lives to seeking the truth.

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Introduction

I have known Dr. Alexandre Doumenach for over 40 years, since our medical school in Paris. It can therefore be said that I know him well and I have learned his character thoroughly. Already several dozen years ago, he impressed me a lot. He was very hardworking. He was one of the best students who whenever he had any doubts, after lectures he always tried to dispel them by asking professors. The search for truth has always been an integral part of his life. He also often helped others when they didn't understand or know something. Meetings where he taught other students were organized. This part of the character hasn't changed either. I am very grateful to be able to write an introduction to his book, which expresses his great personality and aims to convey the truth and help others, so that in the world we live in there may be less unnecessary suffering. This book also expresses something else - courage. Dr. Doumenach was not afraid to write a book that not everyone would like, especially pharmaceutical companies that spend billions on using their products and not some cheap vitamins or minerals. These natural substances would not bring such a profit to anyone and the patient could be cured forever. This is what this book is about; about three amazing substances that promote health.

Dr. Alexandre Doumenach shows, based on many scientific studies, that diseases and conditions such as cancer, atherosclerosis, heart attack, stroke, hypertension, diabetes (both type 1 and type 2), colds, COVID-19, pneumonia, sepsis, Parkinson's disease, Alzheimer's disease, multiple sclerosis, autism, asthma, psoriasis, eczema, acne, rheumatoid arthritis, polycystic ovary syndrome (PCOS), endometriosis, osteoporosis, infertility,

migraines, depression, obesity, fibrocystic breast disease , thyroid disease (hypothyroidism, hyperthyroidism, autoimmune thyroiditis) and fibromyalgia can be significantly prevented, alleviated and even cured. He points out that we need more of these substances; vitamin D, vitamin C and iodine. Therefore, the subtitle of this book is "why more is better." And it is true. Maybe the commonly recommended dose of vitamin C will prevent scurvy, maybe the commonly recommended dose of iodine will prevent goiter, but it certainly will not prevent the diseases and ailments mentioned above. This, referring to each subsequent scientific publication, reveals Dr. Doumenach. It should also be added that he perfectly chose the substances he will write about, i.e. vitamin D, vitamin C and iodine. These are substances with which a lot of solid studies have been conducted, many healthy and sick people are deficient in them, they are cheap, and most importantly, they are extremely effective in preventing and treating diseases.

Dr. Doumenach begins each chapter with a brief introduction, in which he often points to the mechanism of substances in a particular disease entity and prevalence of deficiency. Then he moves to the most important - scientific studies, which are plentiful. This is a feature that sets this book apart from others. The author usually gives details of these studies, including the number of subjects, the dose, and the exact results. Thanks to this, the reader can see a clear picture of the situation and the great abilities of the substance. Thanks to this, the book is also extremely credible. The book is not a collection of the author's beliefs but facts backed up by studies. Unfortunately, most of the books on similar topics are either not

based on studies at all or only to a small extent, and most pages are filled with anecdotes and various stories. In the case of Dr. Alexandre Doumenach's book, it is completely different. In addition, the studies referred to in the book, apart from their large number, are also of various types, ranging from meta-analyzes, randomized controlled trials, cohort studies to case reports. It also gives a clearer picture, e.g. which doses of substances give better results.

Importantly, at the end of each section devoted to each element, the author draws conclusions about the safety and optimal dose for maintaining health. It turns out that all three substances are extremely safe. Higher levels of vitamin D than these recommended do not cause kidney calcification, vitamin C does not cause kidney stones, and iodine does not cause hyperthyroidism, among other things. Studies and experienced doctors, in turn, indicate that we should consume higher doses of these essential substances to stay healthy and recover quickly in case of illness.

Who is this book for? I think for everyone. For everyone who wants to prevent disease and live a healthy life as well as for everyone who is struggling with some disease now. It is very likely that the information in this book will help the person overcome this disease or at least alleviate the unwanted symptoms. Finally, this book is for any physician who wants to broaden their understanding of treatment and treat their own patients effectively. The number of scientific publications on which the book is based will undoubtedly help to achieve this.

- Bernard Fontaine MD

Chapter 66: Cancer

Zava, T.T., & Zava, D.T. (2011). **Assessment of Japanese iodine intake based on seaweed consumption in Japan**: A literature-based analysis. Thyroid Research, 4, 14 - 14.

It is well known that the Japanese have one of the highest intakes of iodine in the world. This is mainly due to the high consumption of seaweeds, which are rich in this element. However, it is not easy to estimate exactly how much iodine the Japanese actually consume as it differs from generation to generation and region to region. The authors of the above publication have just undertaken this task. After a long analysis, they concluded that the Japanese iodine intake largely from seaweeds averages 1-3 mg/day. For example, the Recommended Dietary Allowance (RDA) for adult men and women is only 150 μg/day. So these are amounts that are at least 6.7 to 20 times less than what the Japanese consume on a daily basis. The authors of this publication also mentioned several possible associations between seaweeds and iodine consumption and the unique health statistics of the Japanese. First, the Japanese have one of the highest life expectancy, almost 6 years longer than that of the US. Infant mortality in 2004 was more than twice as high in the USA as in Japan (6.8 vs 2.8/100,000). In 1999, the death rate associated with breast cancer was more than three times higher in the US than in Japan. However, the breast cancer incidence rate increased in Japanese immigrants who had emigrated to the US. In addition, in 2002, the rate of prostate cancer in Japanese was 12.6 per 100,000 and was almost ten times lower than in the United States. As I hope the next

chapter on cancer and iodine will show, this statistic is probably not aleatory.

Kargar, Saeed et al. "**Urinary Iodine Concentrations in Cancer Patients**." Asian Pacific Journal Cancer Prevention : APJCP 18 (2017): 819 - 821.

To begin with, before we move on to the different types of cancer, there is one thing that they all have in common. Namely, they accompany iodine deficiencies. The authors of this publication have confirmed this. They examined iodine levels in 85 Iranian patients diagnosed with different types of cancer. They found that the median urinary iodine concentration was 17.4 µg/L indicating severe deficiency. Overall, 88.1% had severe iodine deficiency (<20 µg/L), 7.1% moderate iodine deficiency (20-49 µg/L), and 2.4% mild deficiency (50-99 µg/L). Thus, only 2.4% of patients had sufficient levels according to the WHO/UNICEF/ICCIDD classification.

Thyroid cancer

ISLER H. **Effect of iodine on thyroid tumors induced in the rat by a low-iodine diet.** J Natl Cancer Inst. 1959 Oct;23:675-93. PMID: 14405943.

More than 60 years ago, Dr. Isler showed in rats that iodine deficiency can lead to thyroid cancer. Rats were on a low-iodine diet which resulted in neoplastic thyroid nodules. After this time they received an iodine supplement. Iodine supplementation resulted in reappearance of thyroid hormone in the blood and normalization of the level of thyrotropic

hormone. Furthermore, iodine caused a regression in the size of the thyroid gland.

Schaller Jr RT, Stevenson JK. **Development of carcinoma of the thyroid in iodine-deficient mice.** Cancer. 1966;19:1063–80.

Other scientists conducted a similar study on rats with similar effects. Within 6 to 12 months of iodine deficiency, 78% (61/78) of mice experienced extreme hypertrophy and hyperplasia of the thyroid. In another eleven of them, the thyroid morphology indicated papillary adenocarcinoma. Additionally, after 18 months, necropsy in 8 of 30 mice revealed malignant neoplasms of the thyroid. Overall, the initial hyperplasia of the thyroid turned into nodular over time. The cysts then emerged and papillary hyperplasia developed. Sometimes it ended with a malignant change. Importantly, these abnormalities proved to be completely reversible up to 9 months when the mice were additionally supplemented with potassium iodide.

Correa P, Welsh RA. **The effect of excessive iodine intake on the thyroid gland of the rat**. Arch Pathol. 1960;70:247–51.

On the other hand, the authors of this publication investigated the effects of excessive iodine doses on the thyroid gland of the rats. Sprague Dawley male rats were given 119 mg of potassium iodide along with the daily diet for 9 months. Iodine caused a significant increase in thyroid weight as well as some histologic changes. However, scientists found no evidence of a reduction in thyroid function. Moreover, thyroid tumors were also not observed.

Liu, Zhiting and Ai-hua Lin. "**Dietary Factors and Thyroid Cancer Risk**: A Meta-Analysis of Observational Studies." Nutrition and Cancer 66 (2014): 1165 - 1178.

In this meta-analysis of 19 observational studies, scientists examined the relationship between dietary factors and thyroid cancer incidence. They analyzed the highest and lowest consumption of fish, vegetables, shellfish, cruciferous vegetables, fruits, meat and grain, and the risk of thyroid cancer in different populations. Overall, the highest fish consumption was associated with a 21% reduction in thyroid cancer risk. Naturally, fish is also one of the main sources of iodine for humans. The results for the other dietary factors were insignificant. In addition, subgroup analysis showed that the highest consumption of fish and shellfish reduced the risk of thyroid cancer by 26 and 54%, respectively. These results were for populations in iodine-poor regions.

Cardis E, Kesminiene A, Ivanov V, Malakhova I, Shibata Y, Khrouch V, et al. **Risk of thyroid cancer after exposure to 131I in childhood**. J Natl Cancer Inst. 2005;97:724–32.

As for radioactivity. The Chernobyl nuclear accident from April 1986 resulted in an increase in incidence of childhood thyroid cancer in radioactively contaminated areas. The iodine 131I isotope was responsible for this. Therefore, a group of scientists decided to specifically evaluate the risk of thyroid cancer after exposure to 131l as well as investigate other promoting factors. They studied 276 case patients with thyroid cancer and 1300 matched control subjects. All of these people were under 15 at the time of the nuclear power plant accident. Scientists observed a strong link

between radiation dose received and thyroid cancer risk. It was even a linear dose-response relationship up to 1.5-2 Gy. As it turned out, in iodine-deficient areas, the risk of radiation-related thyroid cancer was also more than three times greater than elsewhere. Furthermore, scientists calculated that potassium iodide supplementation reduced the risk of radiation-related thyroid cancer by a factor of 3. That is why, in Poland, after the Chernobyl catastrophe, children and adolescents began to be massively given Lugol's solution. This was to prevent the entry of iodine 131I into the thyroid gland and its serious consequences.

Gastric cancer

Gulaboglu, Mine et al. "**Comparison of iodine contents in gastric cancer and surrounding normal tissues**." Clinical Chemistry and Laboratory Medicine (CCLM) 43 (2005): 581 - 584.

Many studies have suggested that iodine is also linked to gastric cancer. One of them is the Turkish one above. Among cancers, stomach cancer ranked first in the north-eastern Anatolia region (Turkey). This region was known for common iodine deficiency. To study this topic, Turkish scientists decided to determine iodine levels in gastric cancer and surrounding normal tissues in 19 patients with gastric cancer. They found that tissue iodine levels were significantly lower in gastric cancer tissue (17.8+/-3.4 ng I/mg protein) than in surrounding normal tissue (41.7+/-8.0 ng I/mg protein). They concluded: "The iodine deficiency in our region may be one of the factors for increased gastric cancer prevalence. Our results support the hypothesis that iodine plays an important role in gastric cancer development."

Behrouzian R, Aghdami N. **Urinary iodine/creatinine ratio in patients with stomach cancer in Urmia**, Islamic Republic of Iran. East Mediterr Health J. 2004;10:921-4.

Iranian authors of the above publication also investigated the relationship between iodine deficiency and stomach cancer. They included 100 patients diagnosed with stomach cancer and 84 healthy people (control group) in whom they measured the ratio of urinary iodine to urinary creatinine. Mean urinary iodine levels in gastric cancer patients (61.9 µg/g creatinine) were significantly lower than in the control group (101.7 µg/g creatinine). Moreover, severe iodine deficiency (below 25 µg/g creatinine) affected 49% of people with gastric cancer and 19.1% of people in the control group.

Scientists also observed something else related to stomach cancer and NIS. The sodium/iodide symporter (NIS) is an integral plasma membrane glycoprotein that mediates iodide transport in the thyroid, salivary glands, lactating breasts and stomach. Namely, scientists noted that NIS expression is significantly limited or even absent in gastric cancer. This is not favorable, which I will mention later in the book.

Breast cancer

Aceves, Carmen et al. "**Is Iodine A Gatekeeper of the Integrity of the Mammary Gland**?" Journal of Mammary Gland Biology and Neoplasia 10 (2005): 189-196.

As I just wrote, iodine is taken up by the sodium/iodide symporter (NIS) in the breasts. There iodine plays an important role contributing to the normal growth of breast tissue and to the integrity of the mammary gland.

High iodine intake (up to 25 times greater than in Western countries) has been linked to the low incidence of breast cancer in Japanese women. In addition, the authors of this publication mentioned that in animal models, iodine in the form of a supplement or seaweed has been shown to inhibit breast cancer cells and tumor growth. They proposed that iodine should be considered as an adjuvant in breast cancer therapy.

Funahashi, Hiroomi et al. "**Seaweed Prevents Breast Cancer?**" Japanese Journal of Cancer Research : Gann 92 (2001): 483 - 487.

The study I posted above is one that investigated the chemopreventive effects of seaweed on breast cancer. These scientists earlier had found that wakame (a type of seaweed) has a suppressive effect on rat mammary tumors, possibly by inducing apoptosis (programmed death of cancer cells). In the present study, in turn, they used seaweed mekabu, which they administered to rats in daily drinking water. This iodine-rich seaweed "showed an extremely strong suppressive effect on rat mammary carcinogenesis". Additionally, in vitro, mekabu solution strongly induced apoptosis in three kinds of human breast cancer cells. The effect of this seaweed turned out to be even stronger than the chemotherapeutic agent known and commonly used in breast cancer.

As for still animal studies on the effects of iodine on breast cancer. Several others also showed that iodine (this time not from seaweed) in high concentrations reduces the occurrence of mammary cancer induced chemically in rats.

Yang, Yoon Jung et al. "**A case–control study on seaweed consumption and the risk of breast cancer.**" British Journal of Nutrition

103 (2009): 1345 - 1353.

Gim and miyeok are some of the most popular and consumed seaweeds in South Korea. They are also the main source of iodine in Korean people. The authors of this publication from Hanyang University investigated the association between the intake of these seaweeds and the risk of breast cancer. 362 women aged 30-65 years old with histologically confirmed breast cancer were included in the study. The scientists also estimated the food intake of these people. They found that the mean intake of gim in people with breast cancer was lower than in the control group. The daily intake of gim was inversely associated with the risk of breast cancer. People with the highest gim consumption (5th quintile) had a 52% lower risk of breast cancer than those with the lowest gim consumption (1st quintile).

Stoddard FR 2nd, Brooks AD, Eskin BA, Johannes GJ. **Iodine alters gene expression in the MCF7 breast cancer cell line: evidence for an anti-estrogen effect of iodine**. Int J Med Sci. 2008;5(4):189-96.

Due to the laboratory evidence that iodine may inhibit cancer growth through modulation of the estrogen pathway, Stoddard and colleagues decided to investigate this topic in more detail. They analyzed the effect of Lugol's iodine solution (5% iodine, 10% potassium iodide) on gene expression in the estrogen responsive breast cancer cell line. Analysis showed 29 genes that were up-regulated and 14 genes that were down-regulated in response to Lugol's iodine solution treatment. These changes concerned genes related to hormone metabolism, regulation of cell cycle growth and differentiation. For example, iodine/iodide treatment increased

BRCA1 activity. BRCA1 protein is known to regulate estrogen signaling in the breast. Moreover, individuals with mutations in BRCA1 are at an increased risk of breast cancers. Potentially, those effects on genes may be important in the prevention or treatment of breast cancer. The authors summarized this study with these words: “In addition to elucidating our understanding of the effects of iodine/iodide on breast cancer, this work suggests that iodine/iodide may be useful as an adjuvant therapy in the pharmacologic manipulation of the estrogen pathway in women with breast cancer.”

Dr. Jonathan Wright also reported that iodine in the form of Lugol's solution can help maintain proper levels between estrogens (estrone, estradiol and estriol), promoting estriol production as well. Higher levels of estradiol and estrone have been linked to a higher risk of developing breast cancer. Moreover, some animal studies have also suggested a preventive effect of estriol in breast cancer.

Nuñez-Anita, Rosa Elvira et al. **“Peroxisome proliferator-activated receptors: role of isoform gamma in the antineoplastic effect of iodine in mammary cancer.**” Current cancer drug targets 11 7 (2011): 775-86 .

The strong anti-cancer effect of iodine is due, inter alia, to 6-iodolactone. 6-iodolactone is one of the iodinated lipids that is formed from iodine and arachidonic acid with the participation of TPO (as seen above). This lipid has an antiproliferative and apoptotic effect on various types of cancer, including breast, colorectal, prostate and thyroid cancer. Thus, simple iodine supplementation can play an extremely important role in the prevention and treatment of cancer. However, for 6-iodolactone to be

formed, iodine concentrations must be higher. Scientists found the presence of 6-iodolactone in people whose daily iodine intake was 15 mg. Therefore, we can assume that doses equal to and greater than 15 mg per day will be appropriate for those who care about the formation of 6-iodolactone. On the other hand, this lipid cannot be detected in the tissues of people who are iodine deficient. The recommended dose of 150 μg does not contribute to this either.

Aceves, Carmen et al. "**The extrathyronine actions of iodine as antioxidant, apoptotic, and differentiation factor in various tissues.**" Thyroid : official journal of the American Thyroid Association 23 8 (2013): 938-46 .

The authors of the above scientific study not only pointed to the reports of other researchers that iodine supplements at low (1.5–8 mg/day) and intermediate doses (10–32 mg/day), ingested from a variety of sources, are well-tolerated in euthyroid subjects, maintaining levels of thyroid hormones (T4 and T3) and thyrotropin (TSH) within normal limits but also suggested iodine supplementation recommendations of at least 3 mg/day for pathologies of tissues that take up iodine (primarily thyroid, mammary, and prostate glands and potentially pancreas, gastric, and nervous systems). They justified this with the antioxidant (10- or 50- fold greater than of ascorbic acid and potassium iodide, respectively) and antiproliferative properties of iodine, which exert a suppressive effect on the development and size of both benign and cancerous neoplasias by contributing to apoptosis and the formation of the aforementioned iodolipids.

Prostate cancer

Hoption Cann SA, Qiu Z, van Netten C. **A prospective study of iodine status, thyroid function, and prostate cancer risk**: follow-up of the First National Health and Nutrition Examination Survey. Nutr Cancer. 2007;58:28-34.

The authors of this publication wanted to investigate the relationship between iodine status and prostate cancer risk as well as the relationship between thyroid disease and prostate cancer risk. To do this, they analyzed the data from the NHANES I Epidemiologic Follow-up Study. The analysis showed that those with the highest iodine levels had a 29% lower risk of prostate cancer compared with those with the lowest iodine levels. Additionally, people with thyroid disease had more than twice the risk of prostate cancer than people without the disease. And people who were diagnosed with thyroid disease more than 10 years earlier had a risk more than three times higher. Later in the book you will learn that the relationship between iodine and the thyroid gland is also very important.

Aranda N, Sosa S, Delgado G, Aceves C, Anguiano B. **Uptake and antitumoral effects of iodine and 6-iodolactone in differentiated and undifferentiated human prostate cancer cell lines.** Prostate. 2013;73:31-41.

There is evidence that iodine treatment is able to inhibit cell proliferation and induce apoptosis in breast cancer and thyroid cancer. In this study, in turn, the scientists wanted to investigate the antiproliferative and apoptotic effects of iodine, iodide and 6-iodolactone in human prostate cell lines. Non-cancerous (RWPE-1), cancerous (LNCaP, DU-145) cells and

nude mice xenotransplanted with cancerous DU-145 were used as a cancer model. RWPE-1 cells were most sensitive to iodide and 6-iodolactone, while LNCaP cells to iodine. Both iodine and iodide caused activation of the intrinsic apoptotic pathway in all three cell lines. Moreover, iodine administration impaired growth of the cancerous (DU-145) tumor cells in nude mice. The above results indicated that in order to obtain the best therapeutic effects, it is probably worth using several forms of iodine simultaneously. Even normal Lugol's solution seems to be appropriate. The authors concluded the study: “Normal and cancerous prostate cells can take up iodine, and depending on the chemical form, it exerts antiproliferative and apoptotic effects both in vitro and in vivo.”

Anguiano B, et al. **Therapeutic effect of iodine on human benign prostatic hyperplasia.** Paper presented at: 14th International Thyroid Congress. September 11-16, 2010. Paris, France. Abstract ITC2010-2585.

In this study, scientists wanted to evaluate the effects of iodine therapy on prostatic hyperplasia in men. Patients received 5 mg of Lugol's solution per day for 8 months. During this time, scientists observed that the characteristic symptoms of benign prostatic hyperplasia decreased by 30 to 40%. In addition, there were also significant declines in circulating PSA levels. High PSA levels may indicate the presence of prostate cancer. Iodine therapy also improved urinary flow in these patients. Importantly, iodine did not change the levels of T3, T4 and TSH and the patients did not report any general health problems.

Anecdotal evidence 1. The older man struggled with a diseased prostate. He had problems urinating, including pollakiuria. For several

months, he increased the daily iodine dose to a final dose of 50 mg per day. Gradually, his prostate-related ailments decreased until after a few months they completely subsided.

Chapter 67: Fibrocystic breast disease

Fibrocystic breast disease is a very common breast condition that affects up to 50% of women between the ages of 20 and 50. It is often associated with symptoms such as breast pain, tenderness and lumpiness that may intensify just before menstruation. Iodine, which some say "loves breasts", is able to get rid of this unpleasant condition. To obtain this effect, as shown by research and medical practice, the dosages used for treatment should be in milligrams. This is mainly due to the fact that iodine plays a significant role in the development and maintenance of healthy breast tissue, and breasts, which require a lot of it.

Ghent, William R Dr et al. "**Iodine replacement in fibrocystic disease of the breast**." Canadian journal of surgery. Journal canadien de chirurgie 36 5 (1993): 453-60 .

This study is a review of three clinical studies examining the response of patients with fibrocystic breast disease to iodine replacement therapy. In the first part of the first study, 233 subjects were treated with 5% Lugol's solution for two years. The daily dose of iodine ranged from 31.25 mg to 62.5 mg. 70% of subjects treated had clinical improvement in their fibrocystic breast disease. Changes in thyroid function appeared in 4% of them and symptoms of iodism were present in 3% of them. In the second part of the first study, 588 patients were given 10 mg of caseinate iodine over a 5-year period. In this case, clinical improvements were seen in only 40% of patients. In the first part of the second study 145 patients treated for several months but not yet cured caseinate iodine (still having residual

symptoms and signs of fibrocystic breast disease) were switched to aqueous molecular iodine therapy in the amount of 0.08 mg/kg (about 3-6 mg per day). As it turned out, after about 10 months, 74.5% of these patients in the crossover series had clinical improvement, having pain-free breasts. In addition, in a group of 108 patients, iodine therapy resulted in the disappearance of microcysts within 5 months. Objective improvement was experienced by 78.1% of these subjects and 98% were pain-free at evaluation. This study also showed that iodine is more effective than iodide in the case of this ailment. This is due to the fact that the breast tissue concentrates iodine. In turn, for example, the thyroid and salivary glands prefer iodide. I will mention this aspect later. The third prospective double-blind study enrolled 56 patients, of which 23 received between 0.7 and 0.9 mg/kg of iodine (so doses were similar to those in the second study) for six months. In the group treated with iodine, 65% of people had subjective improvement, whereas in the control group it was 33% of people. Moreover, 65% of the subjects had an objective improvement in the iodine group. In contrast, there was a 3% objective deterioration in the control group. The side effects of iodine treatment (from the second study with a total of 1,365 patients treated) were minor. For example: nausea was reported in 0.6% of patients, hyperthyroidism in 0.1%, hypothyroidism in 0.3%, and headache in 0.2%. Increased breast pain was the most commonly reported side effect, affecting 5.7% of patients. However, this pain was short-lived and possibly related to softening of the breast and disappearance of fibrous tissue plaques.

Kessler, J. (2004). **The Effect of Supraphysiologic Levels of Iodine on Patients with Cyclic Mastalgia.** The Breast Journal, 10.

Sometime later, Kessler conducted a randomized, double-blind, placebo-controlled trial involving 111 otherwise healthy euthyroid women with breast pain. Patients enrolled in the study had moderate or severe breast pain and fibrosis involving at least 25% of both breast surfaces. Tenderness, and nodularity each cycle was also assessed in these women. Patients were given placebo, 1.5 mg, 3 mg, or 6 mg of iodine daily for six months. Reductions in all physician assessments were observed in patients in the 3 mg iodine group and 6 mg iodine group. However, such an effect was not observed in the 1.5 mg iodine group or in the placebo group. Statistically significant decreases in pain were reported in the two groups with higher iodine doses as early as 3 months after initiation of therapy. Furthermore, in the 6 mg iodine group, 50% of patients experienced clinically significant reduction in overall pain. Importantly, no adverse event was observed for each iodine dose.

Flechas, J.D., **Orthoiodosupplementation in a primary care practice.** The Original Internist, 12(2):89-96, 2005.

Dr. Jorge D. Flechas treated 200 women with fibrocystic breast disease over the course of four years. Women who came to him had a mean Ghent score of 15.7 (which includes micronodularity, tenderness, fibrous tissue plaques, macrocysts and turgidity) and an average age of 41.4 years. He found that the mean score after six months of treatment drops to 12.8, 10.2, and 8.6 at iodine doses of 12.5 mg, 25 mg, and 37.5 mg per day, respectively. When receiving 50 mg of iodine, the patient's mean score

drops to 7.6 within 3 to 6 months and to 3.8 after one year of treatment. There is also sometimes a score of zero and the disappearance of breast pain in 1 to 30 days at a dose of 50 mg. If symptoms resolved completely, he suggested reducing the iodine intake to 12.5 to 25 mg per day. According to him, 50 mg of iodine per day is the optimal dose for this ailment. In his patients undergoing therapy, he did not observe major changes in serum T4, TSH and free T3.

Importantly, the breasts in the case of this condition can also be smeared with iodine (e.g. Lugol's solution). To avoid irritation, iodine can be mixed with some oil beforehand. As always, regular use brings the best results.

Anecdotal evidence

1. The woman started taking iodine more than a year before. She started with a dose of 6.25 mg of iodine slowly up to 50 mg for several months now. After some time, her breasts stopped being tender and, moreover, her periods stopped being very painful and became mild.

2. The middle-aged woman suffered from breast lumps. For this reason, she started iodine therapy at 50 mg iodine/iodide tablets per day. After about a quarter of the year, the breasts were soft and did not hurt. In the meantime, her well-being also improved, the woman had more energy and thought more clearly.

Chapter 68: Thyroid health

Goiter

Marine, David and O. P. Kimball. "**PREVENTION OF SIMPLE GOITER IN MAN: FOURTH PAPER**." JAMA Internal Medicine 25: 661-672.

Almost a century ago, David Marine and O. P. Kimball conducted a study investigating the effects of iodine on the prevention and treatment of goiter. Teenage girls between the ages of 10 and 18 from the city of Akron, Ohio, in which the goiter incidence was over 50%, were included in the study. 2,305 girls were placed in the control group and were not given iodine. In turn, 2,190 girls received a total of 4 grams of sodium iodine per year. They were given 0.2 grams of sodium iodine for the consecutive 10 days each spring and fall. This dose is equivalent to about 10 mg per day. As it turned out, at the first examination, 65% of girls who took iodine had a decrease in the size of the thyroid gland. In the control group it was only 14%. Overall, after more than two and a half years of follow-up, 21.5% of girls in the control group developed thyroid enlargement, whereas in the iodine group it was only 0.2%. Symptoms of iodism (for example unpleasant brassy taste, coryza, sneezing, and headache, which however may disappear quickly) affected less than 0.5% of girls. They were usually mild so supplementation could continue.

Clements, F. W.. "**Goitre prophylaxis by addition of potassium iodate to bread**. Experience in Tasmania." Lancet 1 7645 (1970): 489-92 .

More than half a century ago, iodine, as a universal prophylactic against endemic goiter, began to be administered to infants, preschool

children and schoolchildren from Tasmania. Children were given tablets containing 10 mg of potassium iodide once a week (equivalent to 1.4 mg per day). During the sixteen years of iodine administration, there was a slow steady reduction in the prevalence of goiter. The exceptions were some regions where there was no such significant reduction in the number of thyroid goiters, which was associated with ineffective distribution of the tablets and/or the occurrence of goitrogens.

Hintze, Gerhard et al. "**Treatment of endemic goitre due to iodine deficiency with iodine, levothyroxine or both: results of a multicentre trial.**" European Journal of Clinical Investigation 19 (1989): n. pag.

Researchers have also shown that iodine given to people with goiter may be similarly effective or more effective than administration of levothyroxine alone. They randomized 166 patients into three groups; the first received 150 μg levothyroxine/day, the second 400 μg iodine/day and the third a combination of 75 μg levothyroxine and 200 μg iodine/day. The administration period was 8 months followed by a 4-month break. They documented a significant decrease in goiter size in each of the three groups of -32.1% in the first group, -37.3% in the second and -38.7% in the third. However, unlike the second group where the therapeutic effect was sustained after 4 months of discontinuation of iodine administration, the first group experienced a significant increase in thyroid volume again. In the third group, a slight "rebound effect" was observed, but greater than in the group supplementing iodine alone. Thus, these results indicated that iodine produces the best results in reducing goiter.

Dozens of more recent studies have also shown that goiter is closely related to iodine deficiency, and knowledge in this regard is already fairly common. That is why iodized salt was introduced. For people with urinary iodine concentration below 20 µg/L, the goiter incidence is especially higher. The iodine derived from iodized salt is able to prevent this and increase iodine concentration over these 20 µg/L. However, as has already been seen and will continue to be, iodized salt is not able to provide enough iodine for the proper functioning of the whole organism and protection against many diseases.

Although iodine deficiency in goiter plays a key role, scientists also found other factors that may be involved in the goiter formation process. This is, for example, a deficiency of selenium, iron or vitamin A. Goiter formation can also be promoted by food products such as cassava, lima beans, sweet potato, cruciferous vegetables (cabbage, kale, cauliflower, broccoli) by competing metabolites of certain substances contained in these products with iodine for thyroidal uptake. Similarly for soybeans and millet. Nonetheless, the above products should not be a problem if iodine consumption is adequate.

Thyroid disease

As we already know, severe iodine deficiency is significantly associated with the occurrence of thyroid goiter. Such a deficiency is also associated with hypothyroidism (more on that in a moment). When iodine levels are very low, even though there is an increase in thyroid activity to maximize iodine uptake, the thyroid gland is unable to produce sufficient amounts of thyroid hormones. In cases of mild iodine deficiency, in turn,

increased thyroid activity can compensate for low iodine concentration and maintain a relatively normally functioning thyroid gland. However, this chronic thyroid stimulation may contribute to an increased incidence of hyperthyroidism as well as the toxic nodular goiter. Hence, also, as long as iodine levels do not increase in the population, the prevalence of thyroid disease will be high. Many scientific studies prove this.

Weng, Wan-wen et al. "**A PRISMA-compliant systematic review and meta-analysis of the relationship between thyroid disease and different levels of iodine intake in mainland China**." Medicine 96 (2017): n. pag.

Due to the increasing amount of thyroid disease in China, Chinese scientists decided to investigate the relationship between prevalence of thyroid disease and different urinary iodine concentrations in populations residing in mainland China. They included forty-three articles in this systematic review and meta-analysis. They found the prevalence of thyroid nodules was 22.3%, 25.4% and 6.8% for low-iodine group, medium-iodine group, and high-iodine group, respectively. Thus, the prevalence of thyroid nodules in the populations with the highest iodine intake was significantly the lowest. Additionally, the authors indicated that the prevalence of most thyroid diseases is lowest for urinary iodine concentrations ranging from 100 to 299 μg/l.

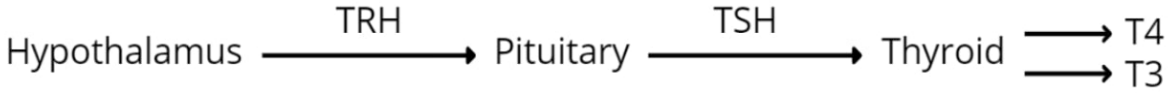
Grussendorf M, Reiners C, Paschke R, Wegscheider K: **Reduction of thyroid nodule volume by levothyroxine and iodine alone and in combination**: a randomized, placebo-controlled trial. J Clin Endocrinol Metab 2011;96:2786-2795.

As the prevalence of thyroid nodules is high, up to 30% in Europe alone, other scientists conducted this prospective, double-blind, randomized, placebo-controlled trial to evaluate the effect of iodine and T4 supplementation on volume of thyroid nodules and thyroid. The study included 1024 euthyroid patients aged 18-64 years with one or more thyroid nodules. These patients were given iodine (150 μg potassium iodide), T4 (75 μg levothyroxine), iodine plus T4, or a placebo for 12 months. As it turned out, after the 1 year period, nodule volume reductions were -17.3% for the combined treatment group (T4+I), -7.3% for the T4 treatment group and -4.0% for the iodine treatment group compared to placebo. The combination of these two therapeutic measures was therefore most effective. As for thyroid volume reductions, they were -7.9%, -5.2%, -2.5% respectively. Hence, from the results of this study, we can conclude that even a relatively small dose of iodine may be effective in reducing thyroid nodules and in combination with T4 even more.

Knudsen, Nils et al. "**Comparative study of thyroid function and types of thyroid dysfunction in two areas in Denmark with slightly different iodine status**." European journal of endocrinology 143 4 (2000): 485-91 .

Danish scientists wanted to compare the prevalence of thyroid dysfunctions in two regions in Denmark with slightly different iodine excretion. To this end, they selected 4649 participants aged between 18 and 65 years from the Civil Registration System in Denmark and collected blood samples from them, evaluated questionnaires and used ultrasonography. In Aalborg, the median iodine excretion was 53 μg/L, whereas in Copenhagen

it was 68 μg/L. Not previously diagnosed hyperthyroidism in people over 40 was found in 1.3% in Aalborg vs 0.5% in Copenhagen. The same pattern was true for not previously diagnosed hypothyroidism. In Aalborg, the prevalence of this disorder was 0.6% compared to 0.2% in Copenhagen. The scientists concluded: "Significant differences in thyroid dysfunction were found between the regions with a minor difference in iodine excretion. The findings are in agreement with a higher prevalence of thyroid autonomy among the elderly in the most iodine-deficient region."



At this point, it is worth mentioning what the regulation of thyroid hormone secretion looks like in a nutshell. This can be seen in part above. The hypothalamus secretes thyrotropin-releasing hormone (TRH). This hormone stimulates the anterior pituitary to synthesize and release thyrotropin (TSH). TSH stimulates the synthesis of thyroid hormones and also stimulates the growth of the thyroid gland. This is when the thyroid gland releases T4 and T3 into the blood, which results in the increase in metabolism. However, we also have negative feedback here. By acting on the pituitary, T4 and T3 inhibit the release of TSH. Likewise, by acting on the hypothalamus, these hormones inhibit the release of TRH. If that's understandable, let's move on to research into the relationship between iodine and various thyroid diseases. We will see, among other things, that higher doses of iodine do not cause them, but rather protect against them.

Teng W, Shan Z, Teng X, et al. **Eff ect of iodine intake on thyroid diseases in China**. N Engl J Med 2006; 354: 2783–93.

In this study, researchers analyzed cohorts from three regions in China with different levels of iodine intake (median urinary iodine excretion), which they defined as mild deficiency (84 μg/L), more than adequate (243 μg/L) and excessive (651 μg/L). Over three thousand participants were followed for five years. The cumulative incidence of overt hypothyroidism for the mildly iodine deficient group, more than adequate iodine intake and with excessive iodine intake was 0.2%, 0.5% and 0.3% respectively. Overt hypothyroidism is when TSH levels are elevated and T4 levels lowered. Hypothyroidism can be accompanied by symptoms such as cold hands and feet, constipation, depression, hypertension, fatigue, hair loss, weight gain or menstrual problems. In this case, the excessive amount of iodine was not associated with a higher cumulative incidence of this ailment. Regarding subclinical hypothyroidism, cumulative incidence was 0.2%, 2.6% and 2.9%, respectively. Subclinical hypothyroidism is when TSH levels are elevated at normal T4 levels. Since the attempt to diagnose certain symptoms specific for this disorder in some patients has failed, the diagnosis can only be made on the basis of laboratory tests. Experienced Dr David Brownstein stated that elevated TSH levels with normal T4 and T3 levels and the absence of clinical symptoms should not be identified as hypothyroidism. Later in this book, I'll also mention why starting iodine supplementation usually leads to elevated TSH levels, which is NIS-related and normal. Coming back to the study above, the cumulative incidence of overt hyperthyroidism was 1.4%, 0.9% and 0.8%, respectively. A higher iodine intake was therefore not associated with a higher amount of hyperthyroidism, quite the contrary. Cumulative incidence of Graves' disease

was very similar in all regions. For autoimmune thyroiditis, the incidence was 0.2%, 1%, and 1.3%, respectively. The next studies I will present will be about thyroiditis and whether it is definitely caused by excessive iodine consumption. The last thing I will mention and have been monitored by researchers is the nodular goiter. Cumulative incidence of this disorder was 5%, 2.4% and 0.8% respectively. This result is therefore similar to those presented in earlier studies.

Okerlund MD. 1979. The clinical utility of fluorescent scanning of the thyroid. In: "**Medical Applications of fluorescent excitation analysis**". Kaufman L, Price D.C. edt., CRC Press Inc. (Florida) pp 149–160.

Dr. Okerlund measured the amount of iodine in the thyroid gland using X-ray fluorescence scanning. He found that the mean value of iodine per thyroid in the US population was 10 mg. In contrast, in the 56 patients suffering from autoimmune thyroiditis he scanned, the mean thyroid iodine value was only 4.8 mg. Furthermore, in 13 patients with autoimmune thyroiditis and hypothyroidism, the mean value was 2.3 mg per thyroid. If it was iodine that caused autoimmune thyroiditis, one would expect more of this element in the affected thyroid glands. Meanwhile, this study showed that there is 2 to 4 times less of it.

DeGroot, L.J., Thompson, J.E., & Dunn, A.D. (1965) Endocrinology 76, 632-639

In vitro studies with purified fractions of calf thyroid glands conducted by De Groot, et al showed that potassium iodide in concentrations of 10 μM has a protective effect (acts against oxidative damage) on TPO. TPO is a key enzyme involved in thyroid hormone synthesis. With an oxidized TPO,

because of the absence of iodine, an autoimmune reaction occurs, damage to the apical membrane of the thyroid cells and, consequently, clinical symptoms of Hashimoto's thyroiditis. In order to achieve the mentioned concentration, which has TPO-protective properties, a person would have to ingest about 54 mg of iodide per day.

Data from Japan also indicated that the incidence of autoimmune thyroiditis is relatively low there. Average iodine consumption, in turn, is measured in this country in mg, not in μg. Milligram doses are also considered by the aforementioned Dr. Brownstein to be appropriate in the treatment of autoimmune thyroid diseases. From his practice and experience, they usually amount to 6 to 50 mg per day.

Although iodine does not appear to cause autoimmune thyroiditis in humans, some in vitro studies have shown that iodine can inhibit normal human thyroid cell proliferation. Such studies immediately frighten many, both ordinary readers and doctors. They are often the cause of the widespread fear of iodine. However, to obtain such an effect, iodine must be in mM concentration. This means that you would have to ingest iodine in gram amounts (many, even over 100 grams). Nobody mentally healthy recommends such amounts of iodine.

Wartofsky L, Ransil BJ, and Ingbar SH. "**Inhibition by iodine of the release of thyroxine from the thyroid glands of patients with thyrotoxicosis**." J Clin Invest, 1970; 49:78-86.

Doses similar to those used by Dr. Brownstein already proved to be beneficial in thyrotoxic patients fifty years ago. Wartofsky, et al administered five drops of lugol's solution three times a day (90 mg iodine/iodide per day)

for 6-7 days to them. They reported: "For these reasons we would conclude that a decrease in the fractional rate of T4 release is at least the major reason that iodine acutely decreases T4 secretion, thereby decreasing serum T4 and ameliorating the clinical manifestations in patients with thyrotoxicosis". This means that iodine at a dose of 90 mg over several days induced a trend towards normalization of thyroid function. Therefore, this observation would indicate that hyperthyroidism should be treated with iodine, and not seen as caused by this element.

Sternthal, E, Lipworth, L, Stanley, B, Abreau, C, Fang, SL, Braverman, LE. **Suppression of thyroid radioiodine uptake by various doses of stable iodide**. N Engl J Med. 1980;303(19):1083–1088.

As for radioactivity. Sternthal with fellow physicians studied the effects of various doses of sodium iodide on thyroid radioiodine uptake in euthyroid volunteers. Participants were given a single dose of 10, 30, 50, and 100 mg of iodide and then doses of 10, 15, 30, 50, or 100 mg daily for the next 12 days. Regarding the results of the study: "These data suggest that the thyroid uptake of radioactive iodine can be markedly suppressed by single-dose administration of 30 mg of stable iodide and that suppression can be maintained with daily doses of at least 15 mg. This study provides guidelines for stable iodide prophylaxis in the event of exposure to radioactive iodine. "

Abraham, G.E., Flechas, J.D., Hakala, J.C., **Orthoiodsupplementation: Iodine Sufficiency of the Whole Human Body**. The Original internist, 2002.

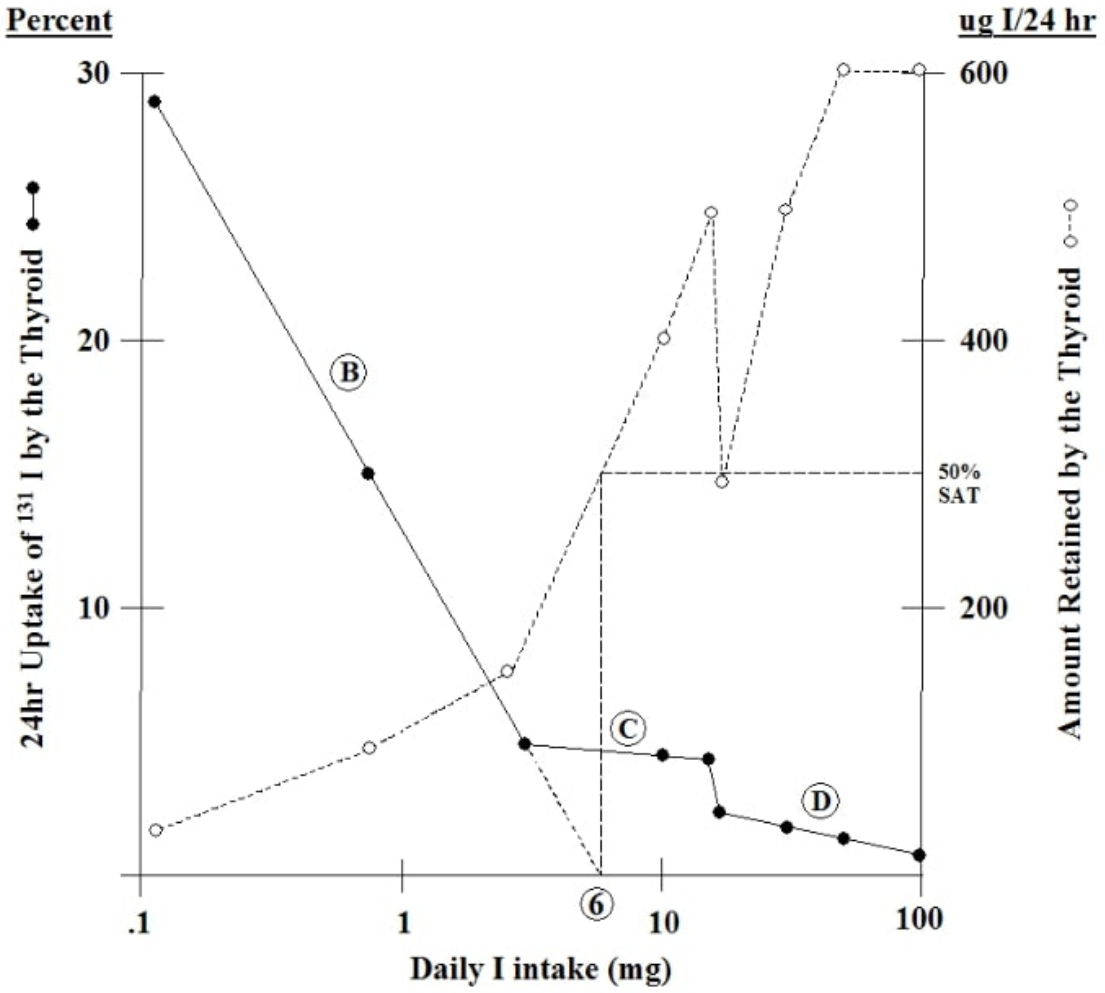


Fig. 2 - Percent 24hr uptake of radioiodide and computed uptake of I/24hr by the thyroid gland, following intake of increasing amount of I.

This graph shows the uptake of radioiodine/24h (percent) and computed uptake of iodine/24h by thyroid gland, following the intake of increasing amounts of iodine. As also shown in a previous study, with higher iodine intake the uptake of radioactive iodine decreases. At that time, there is also an increasing saturation of the thyroid with iodine. As we can see at a dose of about 6 mg serum inorganic iodide is in dynamic equilibrium (balance between reaction rate) with the exchangeable pool of inorganic iodide in the thyroid gland. The maximum amount that did not induce the

autoregulatory mechanism of the thyroid gland was 14 mg. The doctor stated: "This amount may represent the upper limit of I required for sufficiency of the whole human body". After the dose of above about 15 mg of iodine the efficiency of the trapping mechanism further increases and reaches its maximum with a dose of 50 mg. This maximum daily thyroidal uptake was estimated at 0.6 mg/day.

Chapter 69: Cardiovascular health

In the past medicine, there has been a long tradition of using iodine for heart disease (atherosclerosis). Although it was not known exactly how iodine works in this disease, it seemed to be effective. The daily dose was as high as 500-700 mg of potassium iodide three times a day. This is 10,000 to 14,000 times the recommended daily dose of iodine. Nowadays, iodine has been forgotten in this regard, and I hope this short chapter will remind doctors and everyone else about its properties in cardiovascular health.

Cann, S. (2006). **Hypothesis: Dietary Iodine Intake in the Etiology of Cardiovascular Disease**. Journal of the American College of Nutrition, 25, 1 - 11.

Stephen A. Hoption Cann proposed the hypothesis that iodine deficiency can have deleterious effects on the cardiovascular system and therefore increasing the supply of this element would be beneficial. He pointed out that promoting salt restriction (which is some source of iodine in the population) to prevent hypertension and cardiovascular disease could be counterproductive. In the United States, the National Health Survey in the 1970s found that 1 in 40 people had iodine levels indicating moderate or greater deficiency. Twenty years later, 1 in 9 people were severely deficient in iodine. As many studies have shown and as I mentioned earlier, iodine deficiency is closely related to such ailments as hypothyroidism and hyperthyroidism. These diseases, in turn, are associated with a higher risk of heart disease. Although iodine itself has been used in the past as a treatment for cardiovascular disease and hypertension, we have very little modern studies that deal with this topic.

Zalawadiya, Sandip K. et al. “Abstract 16854: **Iodine Deficiency and Risk of Coronary Heart Disease Events Among Low Risk Healthy US Adults**.” Circulation 124 (2011): n. pag.

The authors of the above cross-sectional study wanted to evaluate the effect of iodine deficiency on primary risk of coronary heart disease events. To this end, they analyzed the health data of 10,037 adults who were free of cardiovascular disease and diabetes and participated in the National Health and Nutrition Examination Surveys. They then assessed the Framingham risk score (that estimates the 10-year cardiovascular risk of an individual) and their urine iodine levels. The mean Framingham risk score for those with higher urine iodine levels (over 100 μg/L) was 7.5 compared with 9.4 for those with the lowest levels (under 50 μg/L). Therefore, iodine deficiency was associated with coronary heart disease risk. This risk turned out to be independent of thyroid dysfunction and traditional cardiovascular risk factors.

Herter-Aeberli, Isabelle et al. “**Iodine Supplementation Decreases Hypercholesterolemia in Iodine-Deficient, Overweight Women: A Randomized Controlled Trial**.” The Journal of nutrition 145 9 (2015): 2067-75 .

The purpose of this randomized controlled intervention was to investigate the effect of iodine supplementation on serum TSH, plasma total and LDL cholesterol. The study included 163 iodine-deficient and overweight or obese Moroccan women who received 200 μg oral iodine or a placebo daily for 6 months. During this time, the median urinary iodine concentration increased from 38 μg/L to 77 μg/L. On the other hand, after 6

months, TSH was 33% lower in the iodine group than in the placebo group. Moreover, total cholesterol in subjects with elevated baseline cholesterol (over 5 mmol/L) was reduced by 11% after the supplementation. In the treated group, at 6 months, 21.5% of treated women remained hypercholesterolemic (from the initial 44.2%), whereas in the control group it was 34.8% (from the initial 36.8%). Also the prevalence of elevated LDL cholesterol in the iodine supplement group decreased from 50.6% to 35.4% compared with 47.4% to 44.9% in the control group (however, it was not a statistically significant reduction). The researchers concluded: “Our findings suggest that moderate to severe iodine deficiency in overweight women elevates serum TSH and produces a more atherogenic lipid profile and that iodine supplementation in this group reduces the prevalence of hypercholesterolemia. Thus, iodine prophylaxis may reduce cardiovascular disease risk in overweight adults.”

Chapter 70: Diabetes

Some studies have shown that iodine levels are inversely associated with the blood glucose levels. That is, the higher iodine levels are related to the decreased blood glucose levels. Likewise, it has been found that pregnant and lactating women in areas with significantly higher water iodine levels have a lower risk of hyperglycemia and it is an independent protective factor for this condition. This observation seems to be consistent with that of Dr. Jorge Flechas in his medical practice.

Flechas, J.D., **Orthoiodosupplementation in a primary care practice.** The Original Internist, 12(2):89-96, 2005.

Dr. Jorge Flechas discovered this link by chance while treating a 320-pound woman with insulin dependent diabetes. The woman received standard treatment, was given insulin and had to control glucose levels at home using a glucometer. Two weeks later, she returned to the office for a checkup of her insulin dependent diabetes. During the examination, it turned out that the woman also had fibrocystic breast disease. Therefore, the doctor recommended that she start iodine therapy in the amount of 50 mg per day. A week later the woman called the doctor asking for a reduction in insulin dose due to problems with hypoglycemia. She was told to drop her insulin levels and continue sugar monitoring. Four weeks later, the woman came for a medical appointment. The glucometer record indicated that the woman had average random blood sugar of 98, moreover, she gave up insulin three weeks earlier and did not take any medications to lower blood sugar during this time. She felt it was because of the iodine. Two years later, she still had "excellent glucose control" on 50 mg of iodine per day. Since

then, Dr. Jorge Flechas, et al, also conducted a study on twelve people with diabetes. After supplementation of 50 to 100 mg of iodine per day, half of the patients could discontinue all diabetes-related medications as well as maintain hemoglobin A1C of less than 5.8 with the average random blood sugar of less than 100. The total amount of diabetes-related medications needed was reduced in all patients. In addition, also in type 1 diabetes, the doctor reported the effectiveness of iodine (50 mg/day) in reducing insulin required if C-peptide is measurable.

Chapter 71: Immunity

Iodine appears to be an important factor in our immunity. Studies have shown that the addition of iodine contributed to immunoglobulin G (IgG) synthesis in human lymphocytes. IgG is designed to bind to the pathogen and to destroy it. Another important function of this antibody is to neutralize the toxins produced by pathogenic bacteria. IGg contributes to a much faster response of the body to the infection. A significant decrease in the level of immunoglobulin G in the blood, due to a variety of reasons, increases the patient's susceptibility to bacterial infections. However, this is not the only role iodine plays in maintaining proper immunity. It has been shown that iodine deficiency is associated with decreased phagocytic activity of blood neutrophils and decreased bactericidal properties of the plasma. Neutrophils are the most numerous group of all leukocytes and constitute approximately 70% of white blood cells. When a pathogen enters the body or tissue damage occurs, neutrophils begin to phagocytize the pathogenic compounds. To phagocytize means to engulf or ingest foreign cells or particles. Then they are neutralized by neutrophils with the help of enzymes. Iodine deficiency is likely to contribute to the lack of this important activity. Although there are few studies into the relationship between iodine and the immune system, there are some that clearly indicate the existence of such a relationship.

Derscheid RJ, van Geelen A, Berkebile AR, Gallup JM, Hostetter SJ, et al. (2014) **Increased concentration of iodide in airway secretions is associated with reduced respiratory syncytial virus disease severity.** Am J Respir Cell Mol Biol 50: 389-397.

One of them examining the effect of iodine on immunity has been carried out on animals. Newborn lambs were given potassium iodide by intragastric gavage or were left untreated before intratracheal inoculation of respiratory syncytial virus. Sheep treated with potassium iodide had a 10-fold increase in airway surface liquid (ASL) concentration (which is important in mucociliary clearance and antimicrobial properties of the airway). Moreover, gross lung lesions, expiratory effort, IL-8 and pulmonary expression of an respiratory syncytial virus antigen was reduced in sheep treated with iodide compared to untreated sheep. In a similar experiment with 3-week-old lambs, administration of potassium iodide was associated with a reduction in gross lesions, a reduction in respiratory syncytial virus titers in bronchoalveolar lavage fluid, and a reduction in respiratory syncytial virus antigen expression. Overall, potassium iodide has been shown to be effective in reducing the severity of respiratory syncytial virus infections.

Additionally, several studies showed that Iodine-rich Tasco-Forage, an extract from the brown seaweed Ascophyllum nodosum, led to increased antioxidant activity as well as enhanced immune function in grazing animals.

Marani L, Venturi S. Iodio e immunità ritardata [**Iodine and delayed immunity**]. Minerva Med. 1986 May 7;77(19):805-9. Italian. PMID: 3714096.

Italian researchers Marani and Venturi found significant immune deficiencies in iodine-deficient children. Despite these present deficiencies and the low urinary iodine excretion levels, both T4, T3, and TSH were

normal. Hence, they decided to establish a relationship between dietary iodine and immune response. 607 infants residing in an area of endemic goiter were included in the study. 215 of them received 2 mg of Lugol's solution per week (i.e. about 285 µg per day) for 8 months, while 392 received no iodine. The immune response was assessed by the skin test method. As it turned out, iodine supplementation restored in these children a normal immune response and the conclusion was: "The results appear to indicate that an adequate iodine intake is necessary for normal retarded immune response."

Fischer, Anthony J. et al. "**Enhancement of respiratory mucosal antiviral defenses by the oxidation of iodide.**" American journal of respiratory cell and molecular biology 45 4 (2011): 874-81 .

The authors of the above publication presented a certain mechanism of iodine action leading to the enhancement of antiviral immunity. They showed that iodine delivered to respiratory epithelial cells supports the generation of strongly antimicrobial substances. The iodine addition resulted in a marked reduction of both adenovirus transduction and respiratory syncytial virus titer. Furthermore, they administered a single dose of 130 mg of oral potassium iodide to human subjects. This resulted not only in higher iodide concentrations but also in the accumulation of iodide in upper airway secretions. The study therefore showed that high doses of iodine at one time can lead to amelioration of respiratory viral infections and lower but regular doses would probably be an effective preventive ingredient.

Old medical textbooks for the treatment of infectious diseases recommended doses of potassium iodide as high as 4-6 grams per day. Such doses have been used in the treatment of sporotrichosis, entomophthoromycosis or erythema multiforme. For inflammatory dermatoses, for example, the dose was about 1 gram per day divided into three doses. As an expectorant, potassium iodide was administered in doses of 5-6 grams per day. Topical iodine was also used to treat syphilis and lupus vulgaris. More recent data, in turn, suggested that iodine may lead to inhibition of vacuolation toxin activity of Helicobacter pylori. Hence, it is another possible way by which iodine can also prevent gastric cancer.

Pelletier J, Tessema B, Westover J, Frank S, Brown S, Capriotti J. 2020. **In Vitro Efficacy of Povidone-Iodine Nasal And Oral Antiseptic Preparations Against Severe Acute Respiratory Syndrome-Coronavirus 2 (SARS-CoV-2)** medRxiv.

In this study, povidone iodine nasal antiseptic formulations and PVP-I oral rinse antiseptic formulations (concentrations between 1% and 5%) were examined for virucidal efficacy against the SARS-CoV-2. Regardless of the concentration, both nasal antiseptics and oral rinse antiseptics resulted in complete inactivation of SARS-CoV-2. For this to happen, only 60 seconds of exposure to the agent was enough.

These results are similar to those obtained by many other studies. Scientists demonstrated high bactericidal efficacy of iodine against Klebsiella pneumoniae and Streptococcus pneumoniae, as well as the rapid inactivation of SARS-CoV, MERS-CoV, influenza virus A (H1N1) and rotavirus after just 15 seconds of iodine exposure. In addition, which can be

absolutely crucial, iodine does not make bacteria resistant like antibiotics do.

Brownstein, David G. et al. "**A Novel Approach to Treating COVID-19 Using Nutritional and Oxidative Therapies.**" (2020).

Dr David Brownstein, Dr Richard Ng, et al, conducted an observational case series study on patients diagnosed with COVID-19. One hundred and seven of them who were either diagnosed as COVID-19 positive by PCR nasal swab testing or presumed to have COVID-19 due to symptomatology were included in the study. The most common symptoms of patients in the total cohort (n=107) were: fever (81%), shortness of breath (68%), symptoms including cough (69%), symptoms like diarrhea, loose stools, pain (27%). In the cohort of patients tested positive for COVID-19 (n = 27), these were 93%, 74%, 78%, and 33%, respectively. 99% of patients (n = 106) received oral treatment as the protocol of oral supplements, including vitamin A (100000 IU/day), vitamin D (50000 IU/day), vitamin C (1 gram/hour while awake until bowel tolerance), and iodine (25 mg/day in the form of Lugol's solution or tableted Lugol's solution). Additionally, 30% received intravenous hydrogen peroxide, 35% intravenous vitamin C (2.5 grams of sodium ascorbate), and 35% intramuscular ozone injections. Almost all people (85%) received a nebulized solution of normal saline and dilute hydrogen peroxide and (85%) nebulized iodine. Patients reported the first improvement after an average of 2.4 days, feeling mostly better after 4.4 days and feeling completely better after 6.9 days from the start of treatment. Only three people were hospitalized, two of whom were hospitalized before beginning the

treatment. Overall, of all those treated, all recovered. In other words, there were no COVID-19 related deaths. Despite the fact that there was no control group, it can be concluded that the treatment results were very good. For example, at that time in the state of Michigan the case fatality rate was 9.0%. If this had been the case for this cohort at the time, at least a few people should have died. It is a pity that, despite the fact that more than two years have passed since this very promising publication, there are still no randomized controlled trials carried out and, more importantly, no effective treatment has been applied on a large scale.

Boretti, A., & Banik, B.K. (2021). **Potential Effects of Iodine Supplementation on Inflammatory Processes and Toxin Removal Following COVID-19 Vaccination.** Biological Trace Element Research, 200, 3941 - 3944.

We already know that iodine exhibits strong virucidal activities against SARS-CoV-2. Povidone-iodine has been shown to be able to inactivate the virus quickly. Furthermore, povidone-iodine mouthwash, gargle, and nasal spray have been shown to significantly reduce viral load in patients with COVID-19. Overall, iodine is also an extremely important substance in human immunity, and oral administration may be helpful for COVID-19 as well. The co-author of a previous study, Dr. David Brownstein, recommended 25-100 mg and more if ill of iodine per day. However, it seems that not only in this above, iodine plays a big role. Boretti and Banik suggested that iodine may be a possible agent to limit vaccine adverse events. As it turns out, iodine strongly increases the mRNA decay rate. Hence, although the toxicity of mRNA is marginally researched, scientists

indicated iodine may prevent some of the damages caused by COVID-19 mRNA vaccines. Iodine is also known for its other detoxifying properties (for example, iodine binds to aluminum and mercury), which could also be important in the case of non-replicating COVID-19 viral vectors vaccines.

Chapter 72: Pregnancy, neurodevelopment, deficiency

This chapter is extremely important, especially for women who are planning to have a child and get pregnant. The National Health and Nutrition Examination Survey (NHANES) 2005-2010 showed that the median urinary iodine concentrations of pregnant women indicate iodine insufficiency. A study from Europe found that women in two-thirds of European countries were iodine deficient during pregnancy. Overall, the median of iodine intake of pregnant women was shown to be insufficient in 75% of the studies that were analyzed. This, of course, is not good, even very bad, and has serious consequences. These consequences can affect both the pregnant woman and her child and involve stillbirth, miscarriage, placenta previa, preeclampsia, neonatal hypothyroidism, hypothyroxinemia, intellectual development, IQ and ADHD. I hope that the studies I mentioned will convince every future mother of the importance of taking care of iodine intake and that of every future father of the importance of caring for his woman. We'll start with a few animal studies.

Animal studies

Li, J.Q., Wang, X., Yan, Y., Wang, K., Qin, D., Xin, Z., and Wei, J. 1985. **The effects of severely iodine deficient diet derived from an endemic area on fetal brain development in the rat.** Observations in the first generation. Neuropathol. and Appl. Neurobiol. 12:261-270.

The above study was conducted on rats fed on a severely iodine deficient diet (iodine content 4.5 µg/100 g). The diet was similar to that of the residents of Jixian village in China, who were severely deficient in

iodine and had an 11% prevalence of endemic cretinism. It consisted mostly of crops like maize and wheat, vegetables, and water low in iodine. After 4 months of such a diet, in the intervention group, the thyroid and brain were tested in the adult and their fetuses. Then, the results of this group were compared with the results of the control group (diet with iodine content 54.7 μg/100 g). Scientists found marked goiters and reduced serum T4 in the intervention group. Furthermore, a higher uptake of 125I (radioisotope of iodine) by the thyroid and reduction in brain weight (combined with mean neuron size reduction) was also noted. Overall, iodine deficiency had a detrimental effect on rat fetuses.

Mano, M. T. et al. "**Fetal brain development in response to iodine deficiency in a primate model (Callithrix jacchus jacchus**)." Journal of the Neurological Sciences 79 (1987): 287-300.

Other researchers investigated the effects of dietary iodine deficiency on fetal brain development in marmoset (Callithrix jacchus jacchus). These animals were fed a low-iodine diet of maize, peas, meat meal, Torula yeast, maize oil and added vitamins, minerals and amino acids for 6 months before mating. Later, one group additionally received an iodine supplement. In iodine deficient fetuses at birth, reduced plasma T4 levels, increased plasma TSH levels, increased thyroid weight (enlarged thyroid gland) and reduced thyroid iodine content were observed. There was a significant reduction in the weight of the fetal brain, especially the cerebellum. Histology of the brain revealed morphological changes in the cerebellum and a significant reduction in brain cell number there. The newborn deficient marmosets showed also some sparsity of hair growth. All these

unfavorable changes related to the second pregnancy more than the first one, suggesting greater iodine deficiency then.

Potter BJ, Mano MJ, Belling GB, Mclntosh GH, Hua C, CraggBGet al. **Retarded foetal brain development resulting from severe dietary iodine deficiency in sheep.**Neuropathol-Appl-Neurobiol 1982; 8: 303–313.

A similar study was performed by B. J. Potter, et al, on sheep in which severe iodine deficiency was produced through a diet low in iodine (sheep were fed crushed maize and pelleted pea pollard). In iodine-deficient sheep, researchers noticed both fetal hypothyroidism and thyroid hyperplasia (thyroid enlargement) from 70 days gestation. There was a significant reduction in body and brain weight as well as brain DNA. The brain retardation was present and the deformation of the skull. The absence of wool growth and delayed skeletal maturation near parturition was also characteristic. The cerebellum changes were similar to those reported in the previous study. The same scientist also showed in his earlier study that single intramuscular injection of iodized oil given to the mother deficient in iodine at 100 days gestation leads to partial restoration of the lambs' both brain and body weight as well as maternal and fetal plasma T4 values.

Human studies

Kemp WN. **IODINE DEFICIENCY IN RELATION TO THE STILLBIRTH PROBLEM**. Can Med Assoc J. 1939 Oct;41(4):356-61. PMID: 20321492; PMCID: PMC537512.

As early as 1939, Dr. W. N. Kemp published a study suggesting a direct relationship between iodine deficiency during pregnancy and stillbirths. He found that the administration of iodine to pregnant women

almost completely prevented stillbirths in Vancouver over the course of several years. The work of Lomer and others early investigators would indicate that iodine deficiency may cause abortion in some instances. In addition, the medical experience of Lomer, Lehmann and others in administering very high doses of potassium iodide to pregnant women suggested that women were more tolerant of this element during pregnancy without untoward results.

Dillon, J.C., & Milliez, J. (2000). **Reproductive failure in women living in iodine deficient areas of West Africa**. BJOG: An International Journal of Obstetrics & Gynaecology, 107.

Dillon and Millez investigated the association between iodine status and reproductive failure in a population of West African (iodine deficient areas of Senegal) women. 4908 women, including 1544 adolescents and 462 pregnant women, were examined in terms of the size of the thyroid gland and urinary iodine excretion. They found that repeated miscarriages and stillbirth was significantly associated with low iodine status. The risk increased with the severity of iodine deficiency and was more than three times higher compared to the group with iodine sufficiency.

Pharoah, P.O., & Connolly, K.J. (1987). **A Controlled Trial of Iodinated Oil for the Prevention of Endemic Cretinism**: A Long-Term Follow-Up. International Journal of Epidemiology, 16, 68-73.

In the mid-1960s, in Papua New Guinea, a double blind controlled trial was begun to examine the effectiveness of intramuscular iodinated oil as a prophylactic for endemic cretinism. Infants born between 1966 and 1972 were included into the study and followed up until 1982. There was a

striking difference in the 15-year cumulative survival rate between the iodine group and the non-iodine group in favor of the iodine group. Moreover, the study showed that if the iodine was given before conception the nervous form of endemic cretinism was prevented. Children born to mothers given an iodine supplement performed significantly better, as shown by the measures of motor and intellectual function.

DeLong GR, Leslie PW, Wang SH, et al: **Effect on infant mortality of iodination of irrigation water in a severely iodine-deficient area of China.** Lancet 1997;350:771-773.

As Hotien county in Xinjiang province, China, was an area with widespread severe iodine deficiency and high infant mortality, researchers decided to investigate whether iodine replacement through iodination of the irrigation water would decrease this mortality. They added potassium iodate to irrigation water in certain areas of three townships (Tusala, Long Ru, and Bakechi). Hence, in women of child-bearing age the median urinary iodine concentration significantly increased from below 10 ug/L to 55 ug/L. Infant-mortality rates decreased in the treated areas of Long Ru from mean 58.2/1000 births to 28.7/1000 births, Tusala from 47.4/1000 births to 19.1/1000 births, and Bakechi from 106.2/1000 births to 57.3/1000 births. Additionally, similar results also applied to neonatal mortality. Overall, iodine replacement has probably been an important factor in the national decrease in infant mortality in China.

Cao, X. Y. et al. "**Timing of vulnerability of the brain to iodine deficiency in endemic cretinism**." The New England journal of medicine 331 26 (1994): 1739-44.

The authors of this publication systematically administered iodine to a group of 689 children from birth to three years of age and 295 women at each trimester of pregnancy. These participants lived in the aforementioned iodine-deficient area of the Xinjiang region of China. Researchers wanted to investigate the relationship between iodine and neural development in children. They found that the prevalence of moderate or severe neurologic abnormalities in infants whose mothers received iodine in the first or second trimester was 2% compared with 9% in infants whose mothers received iodine in the third trimester or after birth. The prevalence of microcephaly was 11% for iodine-treated children, whereas in iodine-untreated children was 27%. Furthermore, the developmental quotient at two years of age was 90 for iodine-treated children versus 75 for iodine-not treated children. Overall, up to the end of the second trimester iodine supplementation was the most effective. The results of this study therefore indicated that women who plan to become pregnant should ensure the adequate intake of iodine throughout pregnancy in order to ensure the child's proper neural development, among other things.

The use of iodized salt in Bangladesh, India, Nepal, and Sri Lanka also contributed to positive, though slightly smaller results compared to the previous study. Such an addition during pregnancy was related to increased weight for age and an increased mid-upper-arm circumference during infancy.

Businge, Charles Bitamazire et al. **“Insufficient iodine nutrition status and the risk of pre-eclampsia: a protocol for systematic review and meta-analysis**.” BMJ Open 9 (2019): n. pag.

The results of this systematic review and meta-analysis published by scientists from South Africa also suggest an association between iodine deficiency and pre-eclampsia. Pre-eclampsia is a medical condition that occurs during pregnancy and is characterized by high blood pressure, protein in their urine, and, less frequently, headaches or blurred vision. After analyzing five different studies, these researchers concluded that the frequency of the occurrence of this ailment may be related to the level of iodine. They found that the overall proportions of preeclampsia among women with urinary iodine concentration <150 μg/L and >150 μg/L in two cross-sectional studies were 203/214 and 67/247, respectively. Moreover, in two cohort studies the overall incidence of preeclampsia was 6/1411 and 3/2478, respectively, for the same iodine division as before. Thus, lower urinary iodine concentrations (<150 μg/L) were associated with a 2.85 times higher risk of pre-eclampsia (the result, however, was statistically insignificant at P=0.09).

Yang J, Liu Y, Liu H, Zheng H, Li X, Zhu L, et al. **Associations of maternal iodine status and thyroid function with adverse pregnancy outcomes in Henan Province of China**. J Trace Elem Med Biol. (2018) 47:104–10. doi: 10.1016/j.jtemb.2018.01.013

The authors of the above publication from 2018 investigated the effects of maternal iodine status and thyroid diseases on adverse pregnancy outcomes. Both urinary iodine concentration and thyroid function were measured in 2,347 participants of this prospective cohort study. As it turned out, pregnant women who had urinary iodine concentration between 150 and 249 μg/L had lower incidences of preeclampsia, placenta previa and

fetal distress than women with concentrations below 50 µg/L. Moreover, pregnant women with urinary iodine concentration between 100 and 149 µg/L had lower risks of abnormal amniotic fluid and also fetal distress. The researchers found that in the case of clinical and subclinical hypothyroidism, the risk of preterm delivery increases by 4.4 times and 3 times, respectively. Additionally, hyperthyroidism was found to be significantly associated with miscarriages. The above disorders, as mentioned before, can be also closely related to iodine deficiency.

Kochupillai, N., and Pandav, C.S. 1987. **Neonatal chemical hypothyroidism in iodine-deficient environments**. **In The prevention and control of Iodine Deficiency Disorders.** B.S. Hetzel, J.T. Dunn, and J.B. Stanbury, editors. Amsterdam: Elsevier publ. 85-93.

Kochupillai, Pandav, et al, investigated the relationship between neonatal chemical hypothyroidism and iodine deficiency in newborns. Blood samples were taken from the umbilical vein just after the birth of a newborn. In areas of Northern India which are severely deficient in iodine and more than 50% of the population have iodine levels below 25 µg per gram creatinine, the incidence of neonatal hypothyroidism was 75 to 115 per thousand births. By comparison, in Delhi, in a city where thyroid goiter prevalence is low and there is no cretinism, the incidence was 6 per 1,000 births. In the control area where goiter is absent, the prevalence of hypothyroidism was only 1 per 1000 births.

Other studies have also found a high incidence of neonatal hypothyroidism in areas affected by iodine deficiency. If iodine is not replenished in a timely manner, intellectual disability and physical

development problems may occur in the child in the future. It is also believed that iodine deficiency before and during pregnancy may play a significant role in inducing maternal hypothyroxinemia. Hypothyroxinemia is defined as a normal maternal TSH concentration in conjunction with a low maternal free T4 concentration. There have been several studies already showing that iodine supplementation during pregnancy reduces the risk of maternal hypothyroxinemia. Hypothyroxinemia, unresolved by iodine administration, may be associated with the formation of goiter in both the mother and the fetus. Many observational studies have shown that in regions with severe iodine deficiency, the incidence of goiter during pregnancy is greater. Iodine deficiency is also associated with the thyroidal uptake of radioiodine which, interestingly, is highest in the earliest years of life and declines further over the course of life. Hence, in a child, iodine deficiency can contribute to increased uptake of the radioiodide resulting from nuclear radiation. To prevent this from happening, of course, the child should be given iodine.

Pretell EA, Palacios P, Tello L. **Iodine deficiency and the maternal/fetal relationship**. In: Stanbury JB, editor. Endemic Goiter and Cretinism: Continuing Threats to World Health. Washington, DC: PAHO (1974). p. 143–55.

Prettel et al, conducted a study with the intention of examining the effects of iodine administration on endemic goiter and cretinism in three Andean villages with high incidences of goiter. More than 3,000 people were injected with iodized oil or placebo, 749 of whom were women of childbearing age. In women treated with iodine, mean daily urinary

excretion during pregnancy was 543 µg, whereas in women who did not receive iodine it was only 25 µg. Initially, researchers found no differences between the cognitive outcomes of the offsprings of particular groups. However, this changed when children's iodine status was evaluated. Children in the iodine-sufficient group had significantly higher intelligence quotient (IQ) than children in the iodine-deficient group (85.6 vs 74.4).

Fierro-Benítez, Rodrigo et al. "**Effects on school children of prophylaxis of mothers with iodized oil in an area of iodine deficiency**." Journal of Endocrinological Investigation 11 (1988): 327-335.

Other researchers wanted to examine the effects of iodine on intellectual and psychomotor performance and school performance in children from a rural impoverished and iodine deficient Andean whose mothers received injections of iodinated oil during the first trimester of pregnancy. Two villages (where the women got and did not get iodine) were followed for 20 years, and the neurophysiological effects on the offspring were monitored. Children whose mothers got iodine during pregnancy performed better on tests of psychomotor maturation. Furthermore, they performed even better when evaluated in terms of school drop-out rates, grades achieved and repeated, and in overall performance as judged by teacher notes.

Zimmermann, Michael B. et al. "**Iodine supplementation improves cognition in iodine-deficient schoolchildren in Albania: a randomized, controlled, double-blind study**." The American journal of clinical nutrition 83 1 (2006): 108-14.

This randomized, controlled, double-blind study, in turn, examined the effect of administering iodine to children on their cognitive and motor performance. 310 children aged 10-12 from rural southeastern Albania with low iodine urinary concentrations were given 400 mg of iodine (as oral iodized oil) or a placebo. These children later had to solve several tests checking information processing, working memory, visual search, visual problem solving and fine motor skills. As it turned out, iodine administration significantly improved performance in rapid target marking, symbol search, rapid object naming, and Raven's Colored Progressive Matrices (used to measure general human intelligence and abstract reasoning).

Gordon, Rosie et al. "**Iodine supplementation improves cognition in mildly iodine-deficient children.**" The American journal of clinical nutrition 90 5 (2009): 1264-71 .

A similar study was conducted by scientists at the University of Otago in New Zealand who wanted to investigate whether supplementing mildly iodine-deficient children with iodine improves cognition. In this randomized, placebo-controlled, double-blind trial, 184 children aged 10-13 years were given either 150 µg of iodine or a placebo for 28 weeks. Iodine supplementation had a significant impact on the improvement of cognitive test scores for picture concepts and matrix reasoning. The authors concluded: "Iodine supplementation improved perceptual reasoning in mildly iodine-deficient children and suggests that mild iodine deficiency could prevent children from attaining their full intellectual potential."

Lombardi, Fabrizio Aghini et al. "**Mild iodine deficiency during fetal/neonatal life and neuropsychological impairment in Tuscany**." Journal of Endocrinological Investigation 18 (1995): 57-62.

Italian researchers studied the neuropsychological performance of schoolchildren living in areas with present and past iodine deficiency in Tuscany. They tested neuropsychological performance in 107 children with a median urinary iodine excretion of 64 ug/L living in Borgo a Mozzano, an area of mild iodine deficiency as well as in 106 children with a median urinary iodine excretion of 142 ug/L living in Marina di Pisa, an iodine sufficient coastal village. Such tests were also carried out in 57 children living in the village of Vagli, of which 30 were born before iodine prophylaxis (32 μg/L) and 27 after starting iodine prophylaxis (109 μg/L). After analyzing the results, the authors came to two conclusions; first, even mild iodine deficiency can contribute to disturbing the rate of motor response to perceptive stimuli, also in the absence of general cognitive impairment, second, the effects of iodine deficiency during fetal/neonatal life may be present in later years whether the deficiency was corrected later or not.

Santiago-Fernández, Piedad et al. **"Intelligence quotient and iodine intake**: **a cross-sectional study in children**." The Journal of clinical endocrinology and metabolism 89 8 (2004): 3851-7 .

A similar study to the previous one was carried out by Spanish scientists on 1221 school children from southern Spain in which urinary iodine excretion was measured. They found that intelligence quotient (IQ) was significantly higher in children with urinary iodine levels above 100

µg/l. On the other hand, children who had urinary iodine levels lower than 100 µg/L had a higher risk of having an IQ below 70. Based on these results, the researchers suggested a possibility of improving the IQ by ensuring adequate iodine intake in children (the sooner the better).

Bleichrodt, N., & Born, M.P. (1996). **A metaanalysis of research on iodine and its relationship to cognitive development**.

Bleichrodt and Born in a meta-analysis of 19 studies on neuromotor and cognitive functions in conditions of moderate to severe iodine deficiency concluded that iodine deficiency contributed to loss of 13.5 IQ points at the level of the global population.

Qian, Ming et al. "**The effects of iodine on intelligence in children: a meta-analysis of studies conducted in China**." Asia Pacific journal of clinical nutrition 14 1 (2005): 32-42 .

A few years later, Chinese scientists published a meta-analysis with results similar to the previous of Bleichrodt and Born. They analyzed 37 studies (comparing children living in iodine sufficient and iodine deficient areas as well as those from iodine deficient areas born before and after the introduction of iodine supplementation) including 12,291 children. The analysis showed that in children exposed to severe iodine deficiency intelligence damage was profound and amounted to 12.5 IQ points less. Moreover, an adequate iodine supplementation for mothers before and during gestation contributed to an increase in their children's IQ by 8.7 points.

Iodine deficiency has also been linked to attention deficit hyperactivity disorder (ADHD). In several studies, low iodine intake (<200 µg/day) was

associated with higher child ADHD symptom scores. Moreover, most children with ADHD are iodine deficient.

Chapter 73: Menstrual disorders and reproductive failure

As we already know, iodine deficiency may contribute to both hypothyroidism and hyperthyroidism. These ailments, in turn, are associated with menstrual disorders as well as reproductive failure, including infertility, pregnancy wastage, and failure of lactation.

Joshi, Jaladhi et al. "**Menstrual irregularities and lactation failure may precede thyroid dysfunction or goitre**." Journal of postgraduate medicine 39 3 (1993): 137-41 .

To such conclusions also came the authors of the above publication after analyzing the menstrual and reproductive history of 178 women and comparing the results with 49 healthy controls. They found that only 31.8% of hypothyroid and 35.3% of hyperthyroid women had a normal menstrual pattern compared to 87.8% of healthy controls. Furthermore, reproductive failure (infertility, pregnancy wastage, failure of lactation) affected 37.5% of hypothyroid and 36.5% of hyperthyroid cases versus 16.7% of healthy controls. Interestingly, in a significant proportion of women, menstrual abnormality or reproductive failure and lactation failure preceded the diagnosis of thyroid disease, which may indicate that the main cause of all of this mentioned above is one. This one cause may be iodine deficiency.

Anecdotal evidence

1. The woman tried to have a child for a long time. At the time of visiting the clinic, it turned out that she had a lot of fibroids in her uterus and would probably never have children. She started Neprinol therapy, but stopped after two months. She then took Lugol's solution for several months

in the amount of a few drops, and less than a month before her next visit to the doctor, she started taking 50 mg of iodine/iodide in the form of tablets per day. At the visit, it turned out that her uterus is healthy and there are no traces of fibroids.

2. The woman had cysts on the ovaries as well as uterine fibroid. She took 150 mg of iodine a day and also smeared iodine on abdomen. The cysts on the ovaries began to shrink. In addition, the uterine fibroid was gone.

Chapter 74: Fibromyalgia

I have already written that in the case of fibromyalgia, an ailment characterized by extensive musculoskeletal pain accompanied often by chronic fatigue and sleep disturbance, vitamin D may prove very beneficial. However, doctors from their medical experience have also found that iodine may be another substance helpful in treating this disorder and reducing unpleasant symptoms. Some also conducted a small study.

Abraham, G.E., Flechas, J.D., **The Effect of Daily Ingestion of 100 mg Iodine Combined with High Doses of Vitamins B2 and B3 (ATP Cofactors) in Five Subjects with Fibromyalgia**. The Original Internist, 2008.

Dr. Guy E. Abraham and Dr. Jorge D. Flechas conducted a study investigating the effects of iodine alone and in combination with vitamins B2 and B3 in five patients with fibromyalgia. Three of them had severe fibromyalgia and two had moderate fibromyalgia (FIQ score). In the first phase of treatment, patients took 50 mg of iodine (Lodoral® tablet) twice a day for six weeks, in the second phase, in addition to 100 mg of iodine/day, the patients also took 200 mg of vitamin B2 and 1000 mg of vitamin B3 per day for the next six weeks. The Ghent score for severity of FBD decreased significantly after 12 weeks from the initial mean values SD of 14.6 to 5.4. The mean pressure threshold of tender points (kg/cm2) increased from an initial 51 to 63 after the first phase and 72 after the second phase. This can be seen in more detail in the table below.

	Pre-Intervention	Post-Phase I	Post-Phase II	p - Value
Fibromyalgia Impact Questionnaire (FIQ)	71	70	65	
Zung Depression Score	64	62	56	0.08
Pressure Threshold	51	63	72	0.07
Ghent's Score	14.6		5.4	0.02

Despite the fact that the emerging trends were promising, due to the small number of participants, they did not reach statistical significance. However, one patient responded remarkably well to the treatment. In the table below, I showed that response to intervention.

	Pre-Intervention	Post-Phase I	Post-Phase II
Fibromyalgia Impact Questionnaire (FIQ)	81	61	42
Zung Depression Score	75	64	55
Pressure Threshold	53	76	119
Ghent's Score	13		3

Importantly, the researchers did not observe any side effects in patients using both iodine alone and a combination of iodine with B vitamins. No statistically significant changes were also observed for urinalysis, blood chemistry, hematology, and body composition. These values remained within the normal ranges. There was also no significant change in mean thyroid volumes. However, there was a significant increase in TSH above baseline.

In addition, there was a decrease of all thyroid hormones (total T4, total T3, free T4, and free T3) during the first phase, but the levels of these hormones returned to their baseline levels during the second phase.

Chapter 75: PCOS

Studies have shown that iodine deficiency negatively affects folliculogenesis in the maturation of the ovarian follicle, which in turn may lead to the development of polycystic ovary syndrome (PCOS). Abnormalities of early folliculogenesis have been significantly linked to increased Anti-Müllerian hormone concentrations (which is significantly higher in women with PCOS). Iodine, then, again turned out to be essential, in this case, for the proper functioning of the ovaries. Nonetheless, the link between PCOS and iodine has also been suggested indirectly by studies such as the one below.

Du, D., & Li, X. (2013). **The relationship between thyroiditis and polycystic ovary syndrome: a meta-analysis**. International journal of clinical and experimental medicine, 6 10, 880-9 .

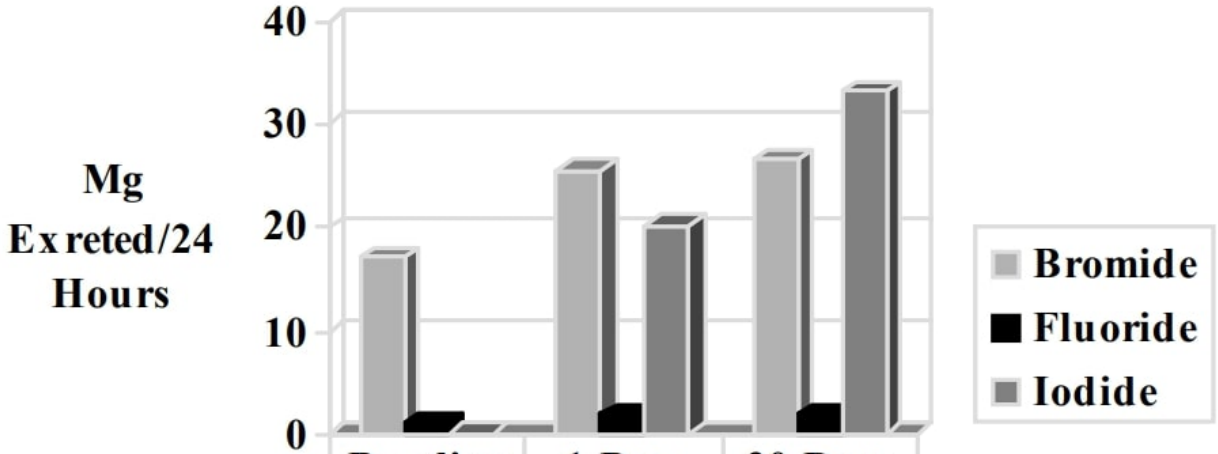
As we already know from the section on thyroid, iodine deficiency is probably significantly associated with autoimmune thyroiditis (AIT). In turn, several studies have reported the link between AIT and PCOS. Hence, Du and Li decided to analyze six studies involving 726 PCOS patients and 879 controls to investigate this relationship closer. They found that the incidence of AIT in women with PCOS was 4.81 times greater than in the control groups. Moreover, two studies also reported the prevalence of goiter in people with PCOS. This prevalence in women with PCOS was 3.36 times higher than in the controls. Undeniably, the presence of goiter is also associated with iodine deficiency, which I have already proven on the basis of several publications.

Flechas, J.D., **Orthoiodosupplementation in a primary care practice**. The Original Internist, 12(2):89-96, 2005.

Dr. Flechas reported that he had five patients with polycystic ovarian syndrome at the time of writing the above article. These patients were treated with 50 mg of iodine per day. This therapy contributed to the disappearance of cysts and stabilization of periods. Moreover, type 2 diabetes mellitus was brought under control.

Chapter 76: Bromine and fluoride

Brownstein, D.G. (2005). **Clinical Experience with Inorganic, Non-radioactive Iodine/Iodide.**



	Baseline	1 Day	30 Days
Bromide	17.06	25.44	26.63
Fluoride	1.07	1.91	1.95
Iodide	0.08	20.13	33.05

Dr. David Brownstein in his office conducted a study on eight randomized patients to evaluate their iodine levels as well as the amount of bromine and fluoride excreted in the urine. First, the excretion of these three elements in the urine was measured before the intervention. It is worth mentioning that no patient had been treated with iodine before. Then, these eight people took 50 mg of iodine/iodide in tablet form (Iodoral®) for 30 days. The averaged results of the study are presented above. As can be seen, iodine excretion increased during the 30 days of supplementation from 40.2% on the first day to 66.15% on the 30th day. This means that the body became more saturated with iodine and therefore excreted more iodine in the urine. Importantly, the body also got rid of more harmful halogens such as

bromine and fluorine. On day 30, after iodine supplementation, the body excreted 56% more bromine and 82% more fluoride than before the supplementation. In a moment I will present why it is so crucial for health.

Bromine

Bromine along with chloride, fluoride, astatine and just our iodine belongs to the group of halogens. One thing that makes bromine harmful to our health is that it competes for the same receptors as iodine. Of course, in order for us to function at all, the thyroid gland must produce hormones for which iodine is essential. When our levels of bromine in the body are high, this element competes with iodine and the thyroid gland can no longer produce adequate amounts of thyroid hormones. Moreover, we know that the whole body needs iodine. Again, high levels of bromine compete with iodine and thus disrupt the work of many organs, which can eventually lead to disease. It should also be added that bromine itself has a toxic effect on tissues. There are many ailments scientists have linked to bromine. These are some of them:

- Animal studies have shown that bromine ingestion may contribute to both hypothyroidism and goiter. This is probably related to what I have already mentioned, that bromine displaces iodine, so that the thyroid gland cannot function properly. Additionally, high levels of bromine have been linked to autoimmune thyroid diseases such as Hashimoto's disease and Graves' disease.

- Scientists found significantly higher levels of bromine in cancerous thyroid tissue than in normal thyroid tissue, which may indicate the carcinogenic properties of bromine. A similar discovery was made in breast

cancer, women with this type of cancer had significantly elevated levels of bromine. In addition, this element has also been linked to prostate and ovarian cancer.

- Bromine poisoning can cause delusions, hallucinations, psychosomatic delay, dementia, lethargy, cognitive impairment, schizophrenia and even suicidal thoughts.

- Bromine toxicity may also manifest itself in nodular acne, dryness and itching of the skin.

- Abdominal cramps and bloating may appear.

- Hearing impairment and even permanent deafness may also occur in the case of elevated bromine.

Unfortunately, humans are highly exposed to bromine and in most cases it cannot be prevented. Bromine is found in everything that surrounds us on a daily basis. Here is a list where we can find it:

- One of the greatest sources of bromine in the US population is bread. Potassium bromate is used extensively in baking to make the dough more elastic and of higher quality.

- Bromine is found in some fertilizers, so people also consume it with vegetables and fruits.

- Bromine has also been found in water.

- Bromine can be found in personal care products, including cosmetics (creams, shampoos, etc), hair dyes, permanent waves and fragrances.

- Bromine is found in cars (armrest, seats, upholstery).

If we are deficient in iodine, daily bromine exposure will be even more detrimental to us. Therefore, it is also one of the reasons why most people

living in our toxic environment should increase their iodine intake.

Fluoride

Fluoride is another element in the family of halogens. Iodine, in turn, can greatly help us remove it from our body. This is crucial because fluoride is a poison to our body that contributes to many ailments later on. Here are some of them:

- Fluoride disturbs iodine uptake by the thyroid gland. Animal studies have shown that exposure to fluoride leads to goiter in iodine deficiency. Similarly, in humans, high fluoride intake in water was associated with a higher incidence of thyroid goiter.

- Fluoride has a negative effect on teeth and bones, contributing to dental fluorosis and fractures.

- Fluoride has been linked to many types of cancer, including breast cancer.

- Excess fluoride leads to lower intelligence, brain disorders, and neurodegenerative diseases such as Azheimer's disease.

- Fluoride can lead to infertility in women.

- Fluoride poisoning can cause abdominal pain, nausea, vomiting and diarrhea.

Fluoride, like bromine, is ubiquitous in our lives. It is even in the water. In the past, water started to be fluoridated to prevent tooth decay. However, many scientists opposed this idea as not scientifically substantiated. Many observational studies have also shown that water fluoridation is ineffective in caries prevention. Even so, in many regions of the world, people still get fluoride from fluoridated water. Actually, it is not the only source of fluoride.

Fluoride is found, for example, in many medications, including antibiotics, antidepressants, painkillers, and cholesterol-lowering drugs. This element can also be found in processed foods and beverages (which were made with the use of fluoridated water), tea or some food (made with fertilizers containing fluoride) such as rape products, cocoa powder and dried fruit. Fortunately, iodine in the right amount can significantly protect us from fluoride from the things mentioned above.

Chapter 77: Safety of iodine

Iodism

Rarely, when the iodine dose is too high a person may experience iodism. The characteristic symptoms of this condition include: unpleasant metallic taste, coryza, increased salivation, sneezing and headache in the area of frontal sinuses. There may also be acne-like skin lesions. When symptoms of iodism appear, it is recommended to either reduce the dose of iodine or stop taking iodine. These symptoms should then disappear within a few days to three weeks. However, as already mentioned, the occurrence of iodism is rare. Dr. Guy Abrahem, el al, reported that in over 150 patients who supplemented with 12.5 mg of iodine per day, no side effects including any iodism were noted. In addition, practice has shown that the symptoms of iodism can be minimized by the use of certain substances. I will mention these substances soon.

Iodine allergy

The radioactive iodine used in various medical procedures is not the one found in e.g. Lugol's solution as iodine/iodide. Hence, people allergic to radioactive iodine are not necessarily allergic to the above-mentioned iodine. Likewise, those who are allergic to shellfish have concerns about iodine supplementation. However, most people allergic to shellfish can take iodine. It is not iodine that is causing the allergic reaction here. On the other hand, if a person is allergic to iodized salt, he or she is probably also allergic to iodine. Dr. David Brownstein claimed that in his twenty years of medical practice, he saw only three people who were allergic to inorganic and non-radioactive iodine, such as Lugol's solution and Lugol's tablets.

Furthermore, some patients can overcome the allergy using e.g. Nambudripad's Allergy Elimination Techniques (NAET).

Thyroid disorders

Many people worry that iodine supplementation can induce hypothyroidism, goiter, hyperthyroidism or cause autoimmune thyroid disease. Although I've already written a bit about this in the thyroid section, there are a few more things to mention. First, I need to describe some iodine-related mechanism that will explain many of the things that were discussed earlier in the book. Attentive readers have certainly noticed that many scientists reported significantly elevated TSH after starting iodine supplementation. I have previously written that TSH stimulates the thyroid gland to produce hormones. However, TSH also has another key function in the body. Namely, TSH also stimulates the body to produce sodium/iodide symporters (NIS), which allows iodine to enter the cell. If the subject is iodine deficient, his body requires a small amount of NIS so that the small amount of iodine consumed on a daily basis can also be transported into the cell. If, on the other hand, the patient starts supplementing with iodine, the body needs more NIS and therefore TSH increases significantly. It is a natural and appropriate reaction of the body. Experienced doctors say that an increase in TSH alone without any clinical symptoms and abnormal changes in T4 and T3 levels is not indicative of hypothyroidism. A transient decrease in T4 and T3 may appear, but it lasts up to several dozen hours. Increased TSH levels usually last up to six months after starting supplementation. Real cases of hypothyroidism or goiter induced by iodine administration, doctors report, are very rare. Dr. David Brownstein, et al,

claim ed from experience with thousands of patients that iodine-induced hypothyroidism affects less than 0.1%. A similar statistic applies to hyperthyroidism, doctors report. However, if a patient has an autonomously functioning nodule on the thyroid gland, it may be associated with the development of hyperthyroidism. Then the patient has to avoid iodine from supplements and food and the nodule has to be surgically removed. In the case of autoimmune thyroid disease. I have mentioned several studies in the thyroid chapter suggesting that autoimmune thyroid disease is caused by an iodine deficiency rather than an iodine excess. Autoimmune diseases of the thyroid gland are also treated with iodine by many physicians who do not report the development of the disease in other iodine treated patients.

Detox

A few pages earlier, I described a study showing that iodine is able to significantly increase the excretion of bromine and fluoride from the body. This halogens excretion, for about 1 in 20 people, is associated with some symptoms like fatigue, brain fog, muscle ache or fever. These symptoms can be minimized or completely eliminated if supplementation is approached in an appropriate way. About this in a moment.

Abraham, Guy E.. "**The Safe and Effective Implementation of Orthoiodosupplementation In Medical Practice**." (2015).

To conclude this section, I will quote the respected Dr. Guy Abraham: "Of all the elements known so far to be essential for health, iodine is the most misunderstood and the most feared. Yet, it is by far the safest of all the trace elements known to be essential for human health. It is the only trace element that can be ingested safely in amounts up to 100,000 times the

RDA. For example, potassium iodide has been prescribed safely to pulmonary patients in daily amounts of up to 6.0 gm/day, in large groups of such patients for several years. It is important, however, to emphasize that this safety record only applies to inorganic, non-radioiodides. Unfortunately, the severe side effects of iodine-containing drugs have been attributed to inorganic iodine/iodide, even though published studies clearly demonstrate that it is the whole organic molecule that is cytotoxic, not the iodine covalently bound to this molecule."

Chapter 78: Requirements and deficiency

In general, every cell in the body utilizes iodine. The thyroid gland contains the most iodine of all organs. However, other parts of the body also contain significant amounts of this element. These body parts include, for example, the breasts, ovaries, salivary glands, brain, gastric mucosa, and eyes. It has been estimated that the thyroid gland itself requires about 6 mg of iodine per day, and the (female) breasts about 5 mg of iodine per day. Totally, the human body may contain about 1.5-2 grams of iodine at sufficiency. This has been calculated on the basis of loading test, retention of iodine by subjects on 50 mg/day for three months. Fat tissue has been estimated to contain 700 mg of iodine and striated tissue 650 mg of iodine. For example, the thyroid gland can hold a maximum of about 50 mg of iodine. Consequently, the common belief that the thyroid gland contains 70% of the body's iodine and that the whole body contains only 15-20 mg of iodine is simply not true. That is also why iodine, as it affects all organs, has such a versatile therapeutic application. And it is not limited to the one mentioned by me. The effect of iodine has also been demonstrated in the case of: eczema, psoriasis, dry skin, allergy, feeling cold, blood pressure, cardiac arrhythmias, depression, ADHD, hair loss, gum pain, scarring, brain fog, fatigue, libido, vaginal infections, fertility (e.g. by lubricating the testicles with iodine diluted in oil), problems with vision, hearing loss, hemorrhoids and headaches.

On the other hand, iodine deficiency can contribute to the ailments mentioned above as well as those mentioned earlier. This deficiency is very

common. Between 1971-1974 and 1988-1994 only, the National Health and Nutrition Examination Surveys (NHANES) showed a significant decrease in urinary iodine levels by more than 50%. The average thyroid gland contains 10-20 mg of iodine, although as I just mentioned, it could be as much as 50 mg. NHANES from 2005-2008 showed that 56.9% of pregnant women have lower urinary iodine concentrations than those recommended by the World Health Organization (WHO). Moreover, currently over 2.2 billion people live in iodine-deficient areas as estimated by standard measurements of urinary iodine concentrations. Dr. David Brownstein et al, in turn, reported iodine deficiency in more than 96% of the patients out of 6,000 tested. They used a different, more reliable method to test the whole-body iodine status - the 24-hours iodine loading test. This test is based on the fact that if the level of iodine in the body is sufficient then most (> 90%) of the 50 mg of iodine taken at the beginning of the test will be excreted in the urine within 24 hours. If, in turn, we are deficient, more iodine will be absorbed and less will be excreted in the urine. It has been assumed that the urinary excretion of less than 90% of the ingested iodine indicates some deficiency. It is worth doing 24-hours iodine loading test before treatment with iodine.

NOTE: Sometimes the result of such a test may turn out to be false when the functioning of the NIS is impaired. Then iodine is ingested and quickly excreted in the urine. In this case, doctors recommend iodine supplementation for three months and repeat the test.

Chapter 79: Initiation of iodine therapy

Although iodine, as already mentioned, is an extremely safe substance, the initiation of therapy may be associated with some unpleasant symptoms, mainly related to the excretion of metals such as bromine or fluoride. It is worth being well prepared for this. Below I will present what this may look like based on the experience of many doctors in the field of iodine treatment.

1. Drinking plenty of water with unrefined salt. Water is the basis for any body detoxification. It is also good if it was of good quality, above all clean. Salt has long been used to remove bromine from the body. Chloride, as we know, is in one family of halogens along with bromine. Therefore it is perfect for detoxifying this element. It is recommended to ingest at least one teaspoon of unrefined salt with water, and to salt the meals as well. Such therapy can be started a few days (or more) before iodine intake is started.

2. Ensuring an adequate supply of supporting substances. These substances include vitamin C in a dose of 3-9 grams per day (e.g. divided into 3 grams three times a day), magnesium in the amount of 300-500 mg per day (e.g. in the form of magnesium citrate), selenium in the amount of 100-200 mg per day and B vitamins. It should also be remembered about a diet rich in nutrients. Later, this diet can replace additional supplementation.

3. Iodine supplementation. Experienced doctors say doses of 12.5-50 mg of iodine per day are appropriate for most people. In the case of serious diseases such as, for example, breast cancer, it may be more. Iodine is recommended in the form of Lugol's solution or in the form of tablets (e.g.

Iodoral®), which contain both iodine and potassium iodide. This is because different parts of the body prefer different forms of iodine, the thyroid gland and skin prefers iodide, whereas the breast and prostate gland prefer iodine. Iodine in the form of Lugol's solution can be taken with e.g. fatty milk, cream or coconut milk to reduce the risk of irritation of the membranes. Some also recommend taking 48 hour breaks from iodine supplementation to give the kidneys a bit of rest during detoxification. In this case, iodine is supplemented for, for example, 5 days and a break is taken for 2 days.

Chapter 80: The optimal daily dose

Back in the 1960s, one slice of bread contained as much iodine as today is the RDA for iodine for an entire day. From the bakery products alone, it was estimated that the average iodine intake had been 726 µg per day. Back then, one in twenty women got breast cancer. Nowadays, when iodine is replaced by bromine, statistics already speak of one in eight women. On the other hand, we have Japan, where one in thirty-eight women will be diagnosed with breast cancer. In the past, this prevalence was even lower. At the very beginning, I mentioned a study in which scientists estimated the daily iodine intake of Japanese people at 1 to 3 mg per day, i.e. 6.7-20 times the current RDA. However, it is not the only publication that addressed this issue. Earlier estimates reported an average iodine intake by Japanese people of about 5.3 mg of iodine per day. Additionally, it is worth noting that the range was between 1.8 and 13.7 mg of iodine per day. This means that there were some who consumed 1.8 mg of iodine a day (12x RDA), but also those who consumed 13.7 mg of iodine a day (91x RDA), mostly from seaweed. And this exact dose (i.e. about 13 mg/day) was considered by one of the most respected doctors in the field of iodine, Dr. Guy Abraham, as the one necessary to maintain iodine sufficiency. Although, as already mentioned, people with diseases related to the thyroid gland, breast, prostate, ovaries, uterus or skin may require more.

Conclusions

This is the right moment for a few conclusions from the book you have read to my delight. I wanted this book to be a little bit different from the others on similar topics. I wanted this book to be largely based on scientific studies and, to some extent, on the medical experience of doctors. The purpose of this was for the reader to see the broader picture. Usually, scientific studies indicate some preventive/therapeutic properties of a specific substance, while medical practice shows that, often at higher doses, this substance is extremely effective in treatment. I wanted to show these two sides. Unfortunately, at the moment there is a lack of large studies using doses that are/were successfully used by some doctors in their practice. Therefore, I have presented these two types of evidence. Another thing that, in turn, I did not want to do was waffle and waste the reader's time on unnecessary stories, as is the habit of many other authors. The book was to be dense in information and studies that are the best source of this information. Therefore, unlike other books, I have provided more details from these studies, not only "substance X was beneficial here". I hope this has helped better understand these three substances, how they work in our body, how safe they are, and what results we can expect from using them.

As for the results, I have proved hopefully they are very often extremely beneficial. I have shown that with the help of these three substances, we can significantly reduce the risk of developing many modern diseases that plague society and contribute to a huge number of deaths. I also proved that if the dose is high enough, it is possible to significantly reduce the symptoms and even completely cure the disease. The question of

dose is particularly relevant here. To achieve the above, the dose must be appropriate, i.e. higher compared to the doses currently used. This applies to both prevention and treatment. Generalizing, as a society, we should consume higher amounts of both vitamin D, vitamin C and iodine to protect ourselves from many diseases, and in the event of illness, patients should be treated with these substances in appropriate amounts for the best results. This has been demonstrated by many scientific studies. Unfortunately, it seems that hardly anyone reads them. What's more, many doctors also belong to this group. Therefore, the last thing left is my request to recommend this book to family, friends and the doctor so that this knowledge spreads and may someday save lives.

From the team

If you have any comments, observations from the supplementation, or anything else you would like to share with Dr. Alexandre Doumenach, please write to the e-mail address - dralexandredoumenach@gmail.com. All messages will be forwarded to the doctor by his team.

We also ask you on behalf of Dr. Doumenach for your honest review on Amazon. This simple gesture will not only be an appreciation for the doctor's work, but also valuable information about the book for many people. Thank you very much.